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# Seventh Annual Report of the Committee on Curriculum Research*

By Professor Wm. Ralph LaPorte, *Chairman,*
*University of Southern California*

## Part I

## Plan of Procedure

THE PROCEDURE as outlined in the 1933 report has been followed in its main essentials. It will be recalled that the plan called for subcommittees, with a division of responsibilities among the several committee members, as follows:

*Division I, Determination of Aim and Objectives,* is expected to formulate a suitable aim and general objectives of physical education as it contributes to the total field of education. It should further determine specific objectives for each of the several school levels and also detailed objectives for each of the many activity units or subjects to be included in the field. All objectives should be formulated in terms of physical, mental, social, and emotional outcomes.

*Division II, Selection and Adaptation of Activities,* is expected to determine appropriate placement of the major subject units within the field as based on their probable contribution to the child's development, and further, to establish appropriate time allotment out of the total program for each of the several teaching units. It is also expected to determine the specific fundamentals of each of the various activities with their appropriate placement and teaching emphasis.

*Division III, Determination of Suitable Teaching Situations and Techniques,* is expected to determine by experimental procedure, the most effective teaching situations and the most suitable devices and techniques for instruction purposes.

Objective experiments dealing with the different types of teaching procedures seem to offer the best possibilities in this field. Two graduate research studies, supervised recently by the writer, indicate very interesting possibilities in this division.

The first study, by Ivan W. Young, was a comparative evaluation of the specific instruction procedure and the informal play procedure in teaching fundamental skills in playground baseball. The results of carefully controlled tests in eight fundamentals of skill performance show for the instruction group, an average improvement of 36.31 per cent; for the play group, 15.62 per cent; and for the control group, .7 per cent. Written knowledge test results were similar. The instruction group showed

* Presented before the College Physical Education Association, December, 1934. A continuation of previous reports published in the May, 1930; March, 1931; May, 1932; March, 1933; and May, 1934, issues of the Research Quarterly.

an improvement of 21.78 per cent; the play group, 4.14 per cent; the control group, 5.71 per cent. Similar improvement was shown in the ability to play actual games. In the final inter-group contest, the instruction group won 5 games and scored 114 runs. The play group won 3 games and scored 70 runs.

The second study by Edwin Kimball was a comparison of the whole and part methods of teaching basketball fundamentals. Carefully equated groups were used in the eleventh grade. The part method included detailed analysis of each fundamental. The whole method was primarily team play with general demonstration, side line coaching, and officiating. The results were similar to that of the first study. The average improvement in percentage for each of the three groups was as follows: part method, 19.4 per cent; whole method, 8.24 per cent; control group, 1.58 per cent.

The above studies are not conclusive, but they are suggestive of methods of approach, and intimate that scientific procedures may offer much in the way of improved instructional technique.

*Division IV, Formulation of Standardized Achievement Tests,* is expected to point the way to specific objective tests for classification purposes, for motivating activities, and for determining actual achievement. As intimated in previous reports, it is highly important that standardized tests be evolved comparable with those in other fields of education. These tests are needed under four major headings:

*First,* skill performance tests in each of the activity units included in the program.

*Second,* knowledge tests involving rules and information relative to performance techniques.

*Third,* knowledge tests involving strategic use of performance skills in various game situations.

*Fourth,* attitude tests involving social appreciations and general principles of conduct, sportsmanship, and leadership.

Such objective tests will do much to give validity and body to the physical education program.

*Division V, Establishing Appropriate Administrative Standards,* is expected to formulate by survey and experimental procedure, the most acceptable standards for administering all aspects of the program. The value of the preceding divisions obviously is dependent upon an effective organizing and administrative procedure.

Each subchairman was authorized to pick additional committee members in his field to cooperate with him in the undertaking. He is expected to work out the minute details of his own procedure, but to follow closely the general program of the committee as a whole. The results of the subcommittee studies will be held together as a unified committee report, in order to maintain a balanced emphasis, and to be sure that each phase of the study is kept up uniformly from year to year. It is anticipated that

the study will continue over many years to come, with constant adjustments and changes as teaching procedures and educational principles undergo modification.

In some cases, subcommittee chairmen wish to present problems for consideration by the society as a whole, hence those subchairmen who can attend the national meeting will present their oral reports in person. All the reports will then be put together for unified presentation in published form.

Parts II, III, IV, V, and VI of this report will each deal with the presentation of one of the subdivision reports.

# Part II

## Report of Subcommittee I
## Determination of Aims and Objectives

By Professor Frank S. Oktavec, Ph.D.
*Wayne University*

The function of this division of the national committee on Curriculum Research was that of determining the aims and objectives of physical education. In order to avoid misunderstandings, the committee decided to give no consideration to the "aims" and to define an "objective" as a *stated asset which a student is to be aided in securing and for the securing of which the teacher (or profession) holds himself (or itself) responsible.*

Under the auspices of this subcommittee, seven studies were undertaken. Two studies dealt with summarizing the physical education objectives now being proposed; three studies attempted to answer the question of child needs; one study worked to establish a basic list of neuromuscular objectives; and one concerned itself with social needs.

The actual data and conclusions of these studies cannot be presented in such a brief report as this so this presentation will consist of (1) a description of the studies undertaken and (2) of certain interpretations of their findings. In these interpretations the subcommittee will describe the problems that the researches of child and societal needs have met and are meeting and will list procedures needed for further progress in determining the basic, concrete, workable objectives of physical education.

### PHYSICAL EDUCATION OBJECTIVES

The first two studies attempted to describe the physical education objectives now being proposed by members of our profession. Bookwalter (Indiana University) tabulated all the objectives listed in twelve books on physical education, in twelve state courses of study, and in seven municipal courses of study. Foran (graduate student at Wayne University) tabulated all the objectives listed in our four professional journals (*Pentathlon*, former journal of the Mid-West Society, *Journal of Health and*

*Physical Education,* RESEARCH QUARTERLY, and the *American Physical Education Review*) for the past ten years, in eleven books on physical education, and in four state courses of study.

These studies show (1) a wide variety of objectives proposed[1] and (2) a large amount of overlapping of the objectives proposed by the same individual or individuals.[2] These studies resulted (1) in an attempt to discover the reasons for this wide disparity and (2) in an attempt at a classification scheme suitable for the classification of any proposed objectives and at stating, in concrete terms, the basic element underlying each group of objectives or the common element any objective needs to possess for its inclusion in any one group. An understanding of these should result in a clearer analysis of any objectives proposed.

The subcommittee suggests that the following four reasons account for the disparity among the objectives of physical education.

*First,* there exists a wide disagreement in the definition of terms. Words like "cooperation" and "coordination" have different meanings to different people and the same single concept is being expressed by means of different words or phrases by different individuals. Most disagreements seem to be due to this phenomenon. *Second,* contradictory beliefs and convictions exist in one and the same individual. This is true, to a greater or lesser degree, of all who are human. It is due fundamentally to conflicting desires within the same individual. *Third,* the generally expressed generalities like honesty, loyalty, coordination, self-control, etc., have not been traced to their logical conclusions therefore their exact meaning is not understood and appreciated. *Fourth,* there exist fundamental differences among people as to life values. The subcommittee believes that at least nine-tenths of our disagreements about objectives are due to one or more of the first three reasons stated.[3]

The major headings of objectives we propose for adoption are as follows: (1) objectives that center around the physical or the somatic growth and development of the individual; (2) objectives that center around the intellectual growth and development of the individual (in this second group would be included only such objectives as ability to think, ability to foresee consequences or cause and effect relationships, ability to plan for the solution of a problem, etc.); (3) objectives that center around the social growth and development of the individual, that is around the relationship of individuals to each other (the so-called "moral" traits would be included here, since they usually express how one feels in one's relations towards others, as contrasted to the so-called "social" traits which usually express how one acts towards others).[4]

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[1] Bookwalter found 149 objectives listed. Of these 75 were of a different nature. Foran found 608 objectives. Of these 93 were of a different nature.

[2] For instance, the same individual would list cooperation and citizenship as two distinct objectives whereas they might well have been grouped together.

[3] See Whitehead in *Process and Reality* and Lotka in *Elements of Physical Biology.*

[4] Such as honesty versus cooperation.

The term "mental" was purposely avoided because of its ambiguous use. To some it connotes only intellectual activities, while to others its meaning includes also emotional ones.[5] The listing of this classification and of the basis for each group may not seem like a contribution to our thinking, but a glance at the large variety of objectives now being proposed makes the adoption of a classification scheme based on such fundamental principles as are here listed highly necessary. So much for the studies relative to the scope of our present day objectives.

## DETERMINATION OF CHILD NEEDS

Since our objectives must be based on the needs, first of children and second of society, three of our studies concerned themselves with the determination of child needs.

Clevett (George Williams College) combined the findings of nine studies reporting child interests objectively. In his summary he lists certain interests which seem to be common for each age level. Hadcock (graduate student at Wayne University) obtained a list of activity preferences by school children and then surveyed the after-school activities of the same children. Mrs. Page (graduate student at Wayne University) combined the child characteristics found in a number of books on genetic psychology.

The findings of these studies clearly contribute to the solution of our problem, but further steps are indicated if we are to discern the child needs—particularly those that we, as physical educators, should primarily be concerned with.

Two notable difficulties have beset our "child interest" studies which have been used as determiners of child needs. The first arises out of the failure to distinguish between what the writer is pleased to call an "urge" and a "taste." An "urge" is the name we give to the condition of the human or animal organism in which the intra-organic condition is out of equilibrium necessitating the organism to act to bring back equilibrium. Some psychologists prefer to call this condition an organic tension, a drive, a set, a readiness-to-act, a motivating condition, a desire, a craving, depending on what school of psychology is being espoused. These inherent urges are our primal urges.

A "taste" is the form whereby the urge expresses itself. To run and to chase are results of urges. The form the running takes, and the type of chasing game participated in and enjoyed, is due to an acquired "taste." To throw may be due to a primary urge. To prefer to throw a rock to a baseball or a spear, and to prefer to throw the rock at a tin can in our own back yard to that of throwing it at a passing cat or at the windows of a deserted factory is due to an acquired taste.

Most check-lists of child interests have given us only a list of ac-

[5] The mental hygienists who deal primarily with emotional instabilities call themselves mental hygienists.

quired tastes. They can however give us more, provided we do two things. First, we need to collect children's tastes from widely different geographical areas and cultures and from widely different chronological times. Second, the common elements present in the activities participated in by any age group would then need to be discovered. A list of these "least common denominators" would be a fairly accurate list of the children's primary urges at each age level.

The second difficulty in our determination of child needs through child interests arises out of our habit of stating the child characteristics according to age group levels. It would be more profitable to take specific urges and show the progressive forms in which they are manifested and the approximate chronological ages when one might expect a normal child to be passing, or to have passed, from one form to the other. To illustrate, imagination is a characteristic of all ages. Knowing the successive forms in which the imaginative urge manifests itself would aid us in appraising each individual's own stage of development or maturation as regards that particular urge and thereby would aid us in discovering where our job lay. A vertical picture of development would be infinitely of greater use than our present horizontal one. So much for the studies dealing with child needs.

## ANALYSIS OF NEURO-MUSCULAR AND SOCIAL OBJECTIVES

Over a period of years, the graduate students in the "Curriculum" course of the chairman of this subcommittee, at Wayne University and at the University of Michigan, have endeavored to analyze the "neuromuscular" objectives generally proposed into a group of elements which it was felt were irreducible. To date we have arrived at the following list: (1) flexibility, (2) strength, (3) balance, (4) reaction time, (5) judgment of time, distance, weight. It is the present belief of this group that all neuromuscular objectives proposed to date are nothing but combinations of two or more of the above specific items. This subcommittee recommends that these be adopted as standards for all further research and for further listings of objectives in this field.

What has been attempted for the neuromuscular objectives must be attempted for the objectives we set up to meet the needs of society. This brings us to our fourth type of research in our endeavor to set up objectives of physical education.

Societal needs are expressed in our everyday living. These daily behaviors of ours consciously or unconsciously steer the urges of the child into its future mold. What do we want this constantly changing organism to accumulate in its travel through life? This is largely a problem of philosophy and of philosophical research. The answer results from an evaluation of what is most good (most satisfying) in life.

Very little has been done in this direction and the results of the meagre studies made to date have netted us few concrete results, because

the gap between our aims and objectives, and our activities has as yet not been bridged.[6] We set up social objectives in most general terms and somehow or other leave it to blind faith to work the miracle of having them acquired by the participants in physical education activities by the mere fact of participation. We have failed to act on what we all recognize to be the truth, namely, that the so-called concomitant learnings are infinitely more important in life than what we learn directly (the three R's, sports, skills, etc.), and because of this we have spent much time in analyzing sports and games into skills with little or no time being devoted to them for their potentialities in teaching specific behavior patterns that will carry over into life.

We all agree that social traits such as loyalty, tolerance, etc., do not exist, yet we insist in listing them without defining them. We say that traits are specific behaviors having a common base, but we have not listed these common elements. Just as soon as we work out a list of the common elements of the multitude of objectives we propose, just that soon and no sooner, will we reduce our list of conflicting and contradictory objectives and arrive at objectives that we really wish to teach and that really are teachable through physical education.

We are in sore need of philosophical research studies that will chisel away the barnacles of high sounding verbiage and half-digested truths and give us concrete, stable, basic objectives. One such study is being undertaken at Wayne University, but it is still in its embryonic stage.

## Part III

## Report of Subcommittee II
## Selection and Adaptation of Activities

By Professor W. R. LaPorte
*University of Southern California*

Two studies were reported in this division last year. The first dealt with the adaptation of the program to the girls' field, and presented definite tables of placement and time allotment for the several activities as interpreted for girls' use.

The second study dealt with a comparative survey of activities in common use as indicated in state and city manuals. This survey indicated a close correlation between the recommended placement of activities in terms of their probable value, and their actual use and emphasis in programs now under way.

Two other supplementary survey studies have been carried on this year, under the direction of the chairman. One of these dealt with the comparative interest appeal of prevailing physical activities. This was handled by a graduate student at the University of Southern California, Mr. Howard Beckner. The second was a preliminary study on the question of selection of fundamentals of activities, their appropriate weight-

[6] See Charters.

ing and order of sequence for teaching purposes. This is being handled by Mr. Richard Ryan, graduate student at the University of Southern California. The second study is still incomplete, but sufficient data are available to give an indication of the procedure followed and type of results being secured.

I. *The Comparative Interest Appeal of Prevailing Physical Education Activities.*—The purpose of this study was to determine the activities in the boys' program which seemed to have the greatest appeal from the standpoint of participation. The further purpose was to get responses as to whether certain factors had any marked influence on this interest. These factors included age, locality, season, experience, opportunity for participation, tradition, and publicity.

There has been a definite question in the minds of the committee from the start as to whether a program formulated by teachers and leaders as most desirable would also be one which would appeal strongly to the participant. It was hoped that this study might indicate the degree of correlation between expert opinion and student interest.

Twenty-one different groups were contacted by the investigator, including five junior high schools, four senior high schools, four junior colleges, and eight adult clubs. The last group, of course, could not be compared with the committee ratings since the latter were confined to school ages only.

Tables I, II, III, and IV show the ranked comparisons of student interest with expert judgment respectively, for the junior high school, senior high school, junior college, and averages for the three preceding.

It will be noted that there is a strong similarity in the two rankings in each table for the total range of activities. The correlation coefficients of .669 for junior high school, .737 for senior high, .698 for college, and .684 for the average, are significant. Some of the differences where students failed to rank activities high in interest can be explained on the basis of their lack of acquaintance with the particular activity. In others, it might be due to their failure to appreciate the contributory values as well as does the expert.

On the whole, the correlation is high enough to assure us that the evaluations and placements of activities as proposed are not far off, particularly if the upper half of the activities are used as a basis of the program for a given school level.

In general, differences were essentially as follows: handball, track, archery, and horseshoes were given higher ranking by students, while volleyball, speedball, squash, and modified games were given a higher ranking by experts. The students considered swimming as the foremost activity, closely followed by football, basketball, tennis, baseball, and track.

The influence of other factors on interest was noted. Age was found to be a major factor in modifying interest. Location and season seemed to have relatively little effect. While there might be some justification for

teaching sports in season there may be equally good reason for putting them at other times in the school year. Experience proved to be a very strong factor in determining whether an activity was liked or disliked. Facilities seemed to have little bearing alone on interest. Tradition seemed to have very little appreciable effect, while publicity was quite significant.

TABLE I

RANK COMPARISONS OF JUNIOR HIGH SCHOOL STUDENT INTERESTS WITH EXPERT JUDGMENT

Correlation coefficient .669

| Activity | Student rank | Expert rank | Activity | Student rank | Expert rank |
|---|---|---|---|---|---|
| Swimming | 1 | 1 | Life saving | 16 | 14 |
| Football | 2 | 3 | Gym games | 17 | 12 |
| Baseball | 3 | 7 | Golf | 18 | 20 |
| Basketball | 4 | 2 | Fencing | 19 | 26 |
| Track | 5 | 10 | Speedball | 20 | 9 |
| Handball | 6 | 17 | Tumbling and pyramids | 21 | 18 |
| Playground baseball | 7 | 4 | Heavy apparatus | 22 | 29 |
| Tennis | 8 | 8 | Volleyball | 23 | 6 |
| Soccer | 9 | 5 | Clog and tap dancing | 24 | 23 |
| Boxing | 10 | 16 | Squash | 25 | 22 |
| Touch football | 11 | 13 | Free exercises | 26 | 27 |
| Wrestling | 12 | 15 | Modified games | 27 | 11 |
| Archery | 13 | 28 | Marching | 28 | 30 |
| Horseshoes | 14 | 25 | Folk dancing | 29 | 29 |
| Water polo | 15 | 21 | Gymnastic dancing | 30 | 19 |

TABLE II

RANK COMPARISONS OF SENIOR HIGH SCHOOL STUDENT INTERESTS WITH EXPERT JUDGMENT

Correlation coefficient .737

| Activity | Student rank | Expert rank | Activity | Student rank | Expert rank |
|---|---|---|---|---|---|
| Swimming | 1 | 1 | Life saving | 16 | 11 |
| Football | 2 | 2 | Golf | 17 | 17 |
| Basketball | 3 | 3 | Fencing | 18 | 25 |
| Baseball | 4 | 9 | Tumbling and pyramids | 19 | 20 |
| Track | 5 | 14 | Horseshoes | 20 | 27 |
| Tennis | 6 | 4 | Volleyball | 21 | 8 |
| Boxing | 7 | 12 | Gymnastic dancing | 22 | 23 |
| Touch football | 8 | 10 | Heavy apparatus | 23 | 28 |
| Handball | 9 | 18 | Gym games | 24 | 13 |
| Playground baseball | 10 | 5 | Clog and tap | 25 | 22 |
| Wrestling | 11 | 16 | Marching | 26 | 30 |
| Soccer | 12 | 6 | Free exercises | 27 | 29 |
| Water polo | 13 | 15 | Squash | 28 | 21 |
| Archery | 14 | 26 | Folk dancing | 29 | 24 |
| Speedball | 15 | 7 | Modified games | 30 | 19 |

TABLE III

RANK COMPARISONS OF COLLEGE STUDENT INTERESTS WITH EXPERT JUDGMENT

Correlation coefficient .698

| Activity | Student rank | Expert rank | Activity | Student rank | Expert rank |
|---|---|---|---|---|---|
| Football | 1 | 3 | Tumbling and pyramids | 16 | 21 |
| Basketball | 2 | 4 | Life saving | 17 | 8 |
| Baseball | 3.5 | 7 | Fencing | 18.5 | 22 |
| Tennis | 3.5 | 2 | Horseshoes | 18.5 | 27 |
| Swimming | 5 | 1 | Speedball | 20 | 9 |
| Track | 6 | 20 | Squash | 21 | 5 |
| Boxing | 7 | 12 | Archery | 22 | 28 |
| Golf | 8 | 11 | Heavy apparatus | 23.5 | 26 |
| Wrestling | 9 | 19 | Clog and tap dancing | 23.5 | 25 |
| Handball | 10 | 13 | Gymnastic dancing | 25 | 23 |
| Playground baseball | 11 | 10 | Marching | 26 | 30 |
| Touch football | 12 | 16 | Gym games | 27 | 17 |
| Volleyball | 13.5 | 15 | Free exercises | 28 | 29 |
| Soccer | 13.5 | 6 | Folk dancing | 29 | 24 |
| Water polo | 15 | 14 | Modified games | 30 | 18 |

TABLE IV

RANK COMPARISONS OF STUDENT INTERESTS WITH EXPERT JUDGMENT BASED ON AVERAGE SCORES FOR THE THREE SCHOOL GROUPS

Correlation coefficient .684

| Activity | Student rank | Expert rank | Activity | Student rank | Expert rank |
|---|---|---|---|---|---|
| Football | 1 | 2.5 | Life saving | 16 | 5.5 |
| Swimming | 2 | 1 | Horseshoes | 17 | 26 |
| Basketball | 3 | 2.5 | Speedball | 18 | 9.5 |
| Baseball | 4 | 8 | Fencing | 19 | 24 |
| Tennis | 5 | 4 | Tumbling and pyramids | 20 | 20 |
| Track and field | 6 | 14.5 | Volleyball | 21 | 9.5 |
| Boxing | 7 | 16 | Gym games | 22 | 12 |
| Handball | 8 | 14.5 | Heavy apparatus | 23 | 27 |
| Playground ball | 9 | 7 | Clog and tap dancing | 24 | 22 |
| Wrestling | 10 | 17 | Squash | 25 | 21 |
| Touch football | 11 | 11 | Gymnastic dancing | 26 | 28 |
| Golf | 12 | 18 | Marching | 27 | 29 |
| Soccer | 13 | 5.5 | Free exercises | 28 | 30 |
| Archery | 14 | 25 | Folk dancing | 29 | 23 |
| Water polo | 15 | 19 | Modified games | 30 | 13 |

II. *Questionnaire Study of Fundamentals, Their Selection, Weighting, and Teaching Sequence.*—This study primarily was a preliminary one to experiment with procedure. It is expected that this procedure will

be modified and used by the chairman for a nation wide study during the ensuing year.

The chairman is operating on the assumption that the next step in the work of Committee No. II will deal with the determination of specific fundamentals for the several activities at the various grade levels; that each activity is built upon certain basic factors which should logically serve as teaching units. These units essentially represent the items in which skill and knowledge are necessary before the performer may become an effective player. The dribble in basketball is an illustration of such a fundamental.

The second assumption is that having determined these fundamentals, the next step is to weight them relatively as to the amount of time that can justifiably be given to them because of their importance or difficulty. For example, one activity, such as basket shooting in basketball, might deserve two or three times as much attention from the point of time as does the dribble.

The third assumption is that having determined the fundamentals and their relative importance or weighting, the next step is to determine the sequence in which they should be presented for the most effective learning. Obviously, some activities should precede certain others. For example, catching a basketball would logically precede a fundamental such as pivoting.

In this particular study, questionnaires were sent to 210 school officials including department heads in large high schools, and county and city supervisors.

The raters were requested to indicate on the proposed list for each activity the ten fundamentals which they considered most important. They were asked next to rate them in order of the sequence which they thought was most logical for instruction presentation. Finally they were asked to indicate the percentage of time which they would devote to each of the ten fundamentals, out of a total of 100 per cent.

The study was undertaken too late to get complete returns before formulating this report. Table V, however, shows the tabulation of ratings from 36 reports returned up to date, on ten different representative activities. In the first column, under teaching units, are indicated the ten activities agreed upon by the group as most important. In the second column under teaching sequence is indicated the order in which the activity should be presented. In the third column under time percentage is indicated the percentage of time to be given each fundamental out of a total of 100 per cent.

The results of this study are not significant except as they indicate a plan of procedure and point the way to the type of results that can be expected. The chairman expects to refine this procedure and use it on a large scale for a nation-wide study for the coming year.

## TABLE V

TEACHING UNITS, SEQUENCE, AND PERCENTAGE TIME ALLOTMENT

| Teaching Unit | Teaching Sequence | Time Percentage |
|---|---|---|
| *Basketball* | | |
| Shooting | 1 | 25 |
| Passing | 2 | 20 |
| Guarding | 3 | 10 |
| Receiving | 4 | 8 |
| Free throw | 5 | 8 |
| Dribbling | 6 | 8 |
| Pivoting | 7 | 8 |
| Starting | 8 | 5 |
| Stopping | 9 | 3 |
| Screening | 10 | 5 |
| *Soccer* | | |
| Dribbling | 1 | 15 |
| Low kick | 2 | 15 |
| High kick | 3 | 10 |
| Stopping | 4 | 8 |
| Chesting | 5 | 7 |
| Volleying | 6 | 10 |
| Corner kick | 7 | 10 |
| Heading | 8 | 7 |
| Passing | 9 | 10 |
| Tackling | 10 | 8 |
| *Touch Football* | | |
| Passing | 1 | 20 |
| Pass receiving | 2 | 10 |
| Catching | 3 | 8 |
| Running with ball | 4 | 10 |
| Kicking | 5 | 10 |
| Line blocking | 6 | 10 |
| Open-field running | 7 | 8 |
| Open-field blocking | 8 | 8 |
| Catching kicked ball | 9 | 8 |
| Stance | 10 | 8 |
| *Golf* | | |
| Stance | 1 | 10 |
| Grip | 2 | 10 |
| Back swing | 3 | 10 |
| Down swing | 4 | 10 |
| Putting | 5 | 20 |
| Midiron shots | 6 | 5 |
| Wood club shots | 7 | 10 |
| Mashie shots | 8 | 10 |
| Mashie niblick | 9 | 10 |
| Niblick | 10 | 5 |
| *Handball* | | |
| Meeting ball | 1 | 10 |
| Ball placement | 2 | 10 |
| Under-arm serve | 3 | 10 |
| Stance | 4 | 10 |
| Side-arm stroke | 5 | 10 |
| Under-arm stroke | 6 | 10 |
| Service back | 7 | 10 |
| Over-arm serve | 8 | 10 |
| Over-arm stroke | 9 | 10 |
| Punch stroke | 10 | 10 |
| *Squash* | | |
| Grip of racket | 1 | 5 |
| Footwork | 2 | 10 |
| Serving | 3 | 15 |
| Ball placement | 4 | 15 |
| Backhand return | 5 | 10 |
| Forehand return | 6 | 10 |
| Position on court | 7 | 5 |
| Lobbing | 8 | 10 |
| Overhead return | 9 | 10 |
| Volleying ball | 10 | 10 |
| *Indoor Baseball* | | |
| Batting | 1 | 25 |
| Ground-ball fielding | 2 | 10 |
| Infield throwing | 3 | 10 |
| Fly-ball fielding | 4 | 10 |
| Catching | 5 | 10 |
| Base running | 6 | 7 |
| Bunting | 7 | 7 |
| Outfield throwing | 8 | 7 |
| Sliding | 9 | 7 |
| Stealing | 10 | 7 |
| *Speedball* | | |
| Passing | 1 | 20 |
| Dribbling | 2 | 15 |
| Catching | 3 | 10 |
| Guarding | 4 | 10 |
| Place kick | 5 | 10 |
| Drop kick | 6 | 10 |
| Trapping | 7 | 6 |
| Jumping | 8 | 7 |
| Pivoting | 9 | 6 |
| Stubbing | 10 | 6 |
| *Volleyball* | | |
| Underhand serve | 1 | 10 |
| Over-arm serve | 2 | 10 |
| Handling high ball | 3 | 10 |
| Handling low ball | 4 | 10 |
| Killing | 5 | 10 |
| Passing up | 6 | 10 |
| Receiving stance | 7 | 10 |
| Setting up | 8 | 10 |
| Spot serving | 9 | 10 |
| Recovering net ball | 10 | 10 |
| *Tennis* | | |
| Forehand drive | 1 | 20 |
| Service | 2 | 10 |
| Eastern grip | 3 | 3 |
| Volleying | 4 | 10 |
| Western grip | 5 | 2 |
| Backhand stroke | 6 | 15 |
| Lobbing | 7 | 10 |
| Overhead smash | 8 | 10 |
| Chopping | 9 | 10 |
| Stance | 10 | 10 |

## Part IV
## Report of Subcommittee III
## Determination of Suitable Teaching Situations and Teaching Techniques

By Professor C. L. Brownell, Ph.D.
*Teachers College, Columbia*

After seeking the advice of the convention, Dr. Brownell requested more time in the preparation of his report.

## Part V
## Report of Subcommittee IV
## Formulation of Standardized Achievement Tests

By Professor Frederick W. Cozens, Ph.D.
*University of California at Los Angeles*

It seems logical to believe that the formulation of tests in connection with the work of this subcommittee should follow the outline suggested in the 1932 report of the Committee on Curriculum Research; namely,

(1) Skill tests in each activity of the curriculum;
(2) Tests in the rules of each activity;
(3) Tests involving strategy in game situations; and finally,
(4) Tests in social attitudes involved in each activity.

A study involving such a broad scope as this will undoubtedly consume a period of years in its formulation, but will, when completed, offer the type of material to use as an accurate measuring instrument with which to evaluate considerable portions of our program content.

The work of the Chairman of your Subcommittee on Tests and Measurements has been devoted this year to the formulation of standardized procedures in skill tests covering a number of activities, to the collection of data on performances in these tests, and finally to the setting up of achievement scales in thirty-five events in six activities.

Before summarizing the detailed work of the subcommittee the purpose of the study thus far should be made clear.

Progress in the program of physical education during the past twenty years has been due largely to (1) an increase in facilities and time allotment, (2) to a more adequate preparation of teachers, and (3) to a more scientific approach in attacking our problems. Unquestionably, the recent improvement in our measuring devices has given considerable impetus to our scientific approach, but still a considerable proportion of the profession is not aware of the need for scientifically constructed scales by which to measure achievement in physical education activities. Briefly, such scales will serve the following purposes:

1. They will serve to interest students in all-round physical development through a fair evaluation of their efforts. The measurement of

pupil progress and improvement is very essential if we are to hold the student's interest over a period of time.

2. They may be used to determine the skill status of the student so that a program adapted to his needs may be prescribed. A very important factor in prescribing a program for the student lies in the ability of the instructor to diagnose his strengths and weaknesses in particular phases of our activity work as well as in all-round ability.

3. They may also be used as a means of predicting probable future success in a particular activity, that is, as prognostic tests.

4. Finally, achievement scales offer a very definite aid in further research and experimentation in our field. They are indispensable guides in many problems of teaching and administrative procedures, curriculum content, and in the psychologic, physiologic, and sociologic aspects of the field of physical education.

## THE CLASSIFICATION OF COLLEGE MEN

Classification or grouping of boys and girls for purposes of fair competition has been a concern of physical educators since Reilly's study in 1917.[1] Though not truly scientific, Reilly's study was the forerunner of a number of studies which now enable us to group scientifically boys and girls from the elementary school through the college age level.

In the classification of college men, the factor of age must be omitted since, in this group, the relationships of age to performance in a wide variety of events is nearly zero. Height and weight, however, cannot be neglected since we find sizeable relationships existing between these factors and performance in the various elements of athletic activity. Because these relationships are not of sufficient size for prediction purposes, some arbitrary plan of classification seems imperative.

The arbitrary classification set up in this study was established according to the following plan:

1. A height distribution of 7,389 entering college freshmen was compiled.

2. Lacking a criterion of what constitutes tallness or shortness, the upper 25 per cent of this height group was arbitrarily assigned a designation as "tall" and the lower 25 per cent a designation as "short." The measure used to determine the upper and lower limits of the "medium" height group was one probable error on each side of the mean.

3. Distributions of weight for each inch of height were then made and the "medium" weight groups in each instance taken as representing the middle 50 per cent. *All heights and weights were taken without clothing.*

4. Such a grouping automatically divides men into nine classes, namely,

| | | |
|---|---|---|
| Tall Slender | Medium Slender | Short Slender |
| Tall Medium | Medium Medium | Short Medium |
| Tall Heavy | Medium Heavy | Short Heavy |

[1] J. F. Reilly, *New Rational Athletics for Boys and Girls*. New York: D. C. Heath and Company, 1917.

There is a decided advantage to this type of classification in that the mention of a man's classification, as for example, *Short Heavy*, immediately gives the instructor a very definite idea of the individual's type of stature in contrast to groupings of Class *A*, Class *B*, etc.

The chart shown below gives in tabular form material for classifying college men according to the factors of height and weight.

CHART FOR HEIGHT-WEIGHT CLASS DIVISION OF COLLEGE MEN

| | Height | Weight: Slender | Medium | Heavy |
|---|---|---|---|---|
| Short | 4-11 | Up to 92 | 93-108 | 109 up |
| | 5-0 | Up to 97 | 98-112 | 113 up |
| | 5-1 | Up to 101 | 102-117 | 118 up |
| | 5-2 | Up to 106 | 107-121 | 122 up |
| | 5-3 | Up to 110 | 111-126 | 127 up |
| | 5-4 | Up to 114 | 115-131 | 132 up |
| | 5-5 | Up to 118 | 119-135 | 136 up |
| | 5-6 | Up to 121 | 122-139 | 140 up |
| Medium | 5-7 | Up to 124 | 125-143 | 144 up |
| | 5-8 | Up to 128 | 129-147 | 148 up |
| | 5-9 | Up to 131 | 132-150 | 151 up |
| | 5-10 | Up to 134 | 135-153 | 154 up |
| Tall | 5-11 | Up to 138 | 139-157 | 158 up |
| | 6-0 | Up to 142 | 143-162 | 163 up |
| | 6-1 | Up to 146 | 147-166 | 167 up |
| | 6-2 | Up to 150 | 151-171 | 172 up |
| | 6-3 | Up to 154 | 155-175 | 176 up |
| | 6-4 | Up to 158 | 159-179 | 180 up |

*Procedure for Use of Chart*

1. Short men are those 5–6¾ and under; tall men are those 5–10½ and over.
2. Short men comprise 25 per cent of the group; medium height men 50 per cent; and tall men 25 per cent.
3. In the weight groups, slender men are in the lower 25 per cent; medium weight men in the middle 50 per cent; and heavy men in the top 25 per cent.
4. After obtaining height and weight of student, consult chart for division into one of nine possible classes:

| | | |
|---|---|---|
| Tall Slender | Medium Slender | Short Slender |
| Tall Medium | Medium Medium | Short Medium |
| Tall Heavy | Medium Heavy | Short Heavy |

5. After classifying student according to a Height-Weight Division, obtain score from *Achievement Tables* for the particular classification.

## ACTIVITY TESTS INCLUDED IN THE STUDY

Tests for activities in this study may be grouped according to the plan suggested in the 1931 Report of the Committee on Curriculum Research:[2]

I. Aquatics

1. Swimming and Diving. (No tests set up).*
2. Life Saving. (No tests set up)

[2] Wm. Ralph LaPorte (Chairman), "A Study of Relative Values of Thirty Important Activities in the Physical Education Program for Boys," RESEARCH QUARTERLY, AMERICAN PHYSICAL EDUCATION ASSOCIATION, II: 1 (March, 1931), 168.

* Meaning no tests set up in this study.

II. Combatives
1. Boxing. (No tests set up)
2. Wrestling. (No tests set up)
3. Fencing. (No tests set up)

III. Gymnastics
1. Gymnastic Games and Relays. (No tests set up)
2. Tumbling and Pyramids.
   a) Frog Stand for time.
   b) Push-up (from floor).
   c) Running high dive.
   d) Running long dive.
   e) Standing high kick.
3. Heavy Apparatus
   a) Bar mount for time.
   b) Bar snap for distance.
   c) Bar vault for height.
   d) Dip (on parallel bars).
   e) Half-lever (on parallel bars).
   f) Pull-up (chin).
   g) Rope Climb (20 feet).
4. Free exercises. (No tests set up)
5. Marching. (No tests set up)

IV. Individual Sports
1. Tennis. (No tests set up)
2. Track and field.
   a) Discus throw
   b) Dodging run
   c) Half mile run
   d) Medicine ball run
   e) 100-yard dash
   f) 120-yard low hurdles
   g) 440-yard run
   h) Running broad jump
   i) Running high jump
   j) Running hop, step and jump
   k) Shot put (12 lb.)
   l) Standing backward broad jump
   m) Standing broad jump
   n) Standing hop, step and jump
   o) Two-mile walk
3. Golf. (No tests set up)
4. Handball. (No tests set up)
5. Squash and Squash Tennis (No tests set up)
6. Archery. (No tests set up)
7. Horseshoes. (No tests set up)

V. Rhythmics
1. Clog and Tap Dancing. (No tests set up)
2. Gymnastic Dancing. (No tests set up)
3. Folk Dancing. (No tests set up)

VI. Team Games
1. Football
   a) Drop kick for accuracy
   b) Football pass for accuracy
   c) Football pass for distance
   d) Football punt for distance
2. Basketball
   a) Basketball goal throw
   b) Basketball throw for distance
   c) Jump and reach
3. Playgroundball
   a) Playground baseball throw for distance
4. Soccer. (No tests set up)
5. Speedball. (No tests set up)
6. Volleyball. (No tests set up)
7. Baseball. (No tests set up)
8. Touch football. (No tests set up)
9. Water Polo. (No tests set up)
10. Modified Games. (No tests set up)

## STANDARDIZED DIRECTIONS FOR INDIVIDUAL TESTS

Standardized procedure has been formulated for thirty-five events in all. To illustrate, a sample for one event is offered.

### Bar Snap for Distance

A. *Equipment Needed.*—One or several adjustable horizontal bars. These may be either inside or outside. If inside, mats for landing must be provided; if outside, a sawdust or sand pit will serve the purpose.

B. *Description.*—The stunt consists in grasping the bar while standing on the floor or ground facing it, swinging underneath with the feet close to the bar, shooting the feet upward, arching the back, and letting go of the bar at the right moment to give distance, landing on the feet.

For ease in administration, stretch a tape on the floor or ground from the plane of the bar outward. Distances can then be estimated closely and called off rapidly without the necessity of taking more exact measurements.

C. *Rules.*—1. The bar must be set at a height of four feet, six inches above the floor or ground.

2. The contestant must stand on the floor or ground grasping the bar preliminary to the take-off.

3. No run or mounting the bar is allowed.

4. Three trials are allowed and the contestant's score recorded as his best snap in feet and inches, to the nearest inch. Measurements are taken on the ground or floor from the plane of the bar to the point nearest the plane of the bar where any part of the body touches.

## PROCEDURES USED IN THE CONSTRUCTION OF SCALES

Data used in the construction of the 35 achievement scales were collected at the University of California at Los Angeles in required class work in physical education during the period between the years 1926 and 1934. The number of men tested in each event ranges between 500 and 5,000. The total number of cases necessary in an event to formulate a respectable distribution in each height-weight division is governed entirely by a percentage situation. Out of 1,000 cases, only 62 of them, under normal circumstances, will fall in the following divisions—Tall Slender, Tall Heavy, Short Slender, Short Heavy; 125 cases will ordinarily be Tall Medium, Medium Slender, Medium Heavy, or Short Medium; while 250 will inevitably be Medium Medium. In order to get at least 100 cases in the Short Slender group, for example, 1,600 men will have to be tested in a particular event.

After grouping men according to one of the nine height-weight divisions, scores were tabulated and means and standard deviations computed. It was found that the standard deviations of all height-weight divisions in a particular event were approximately the same and hence these were averaged as offering the best-fit sigma of that event.

The question immediately arises as to the type of achievement scale which should be set up. It has been shown that with heterogeneous groups the *increased increment* plan of scoring should be used, that is, that point or score awards should become increasingly larger for a given increment of time, distance, or height as the scale approaches the upper limit.

Since, with the classification scheme used in this study, namely, height-weight class divisions, an attempt has been made to group men homogeneously, it seems reasonable to present a plan of scoring known as the *equal-step interval* in which progress is made by equal steps throughout the scoring scale.

In determining an upper and lower limit for scales it was found that the mean $\pm$ three standard deviations seemed to fit the situation as it covers the range of performance and is possible of attainment at the upper end of the scale and allows practically every man to receive a score at the lower end of the scale. Theoretically, the scale excludes at each end only 1½ cases out of 1000.

All scales, therefore, have been set up in such a manner that a score of 50 is the performance level at the mean or average, a score of 100 at three standard deviations above the mean and a score of zero at three standard deviations below the mean. Increments for each score increase will then be $\frac{(6\ sigma)}{(\ 100\ )}$.

Each scale has been constructed on this basis and consequently identical scores on all scales represent equivalent performances. This will make possible the addition or averaging of scores on several events in order to obtain total performance ability.

## HOW TO USE THE ACHIEVEMENT SCALES

1. Classify the student to be tested according to the Height-Weight Division Chart, that is, tall slender, medium heavy, short medium, etc. as the case may be.

2. Obtain his performance score in the event desired. For example, Bar Snap for Distance, Short Slender, 5 feet, 8 inches.

3. Consult the Achievement Scale for the Bar Snap and run down the column under the student's classification until his performance score is found. Then read the Achievement Score on the right or left. In this case it will be fifty-eight.

A sample of the achievement scales set up is shown in the accompanying table.

## SUMMARY AND RECOMMENDATIONS

1. This study is only a small beginning on the measurement program which should be undertaken as a definite project for the future by the Association.

2. A classification plan for grouping college men according to the factors of height and weight has been suggested in this study. The plan has been in operation for a number of years at the University of California at Los Angeles and appears to fit the situation. It should either be adopted or rejected by the Association.

3. The plan of scoring achievement should be made standard throughout the various divisions of the measurement of motor skills.

## College Men
### Bar Snap for Distance

| Score | Tall Slender | Tall Medium | Tall Heavy | Medium Slender | Medium Medium | Medium Heavy | Short Slender | Short Medium | Short Heavy | Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | Height-Weight Divisions | | | | | | | | | |
| | Distance in Feet and Inches | | | | | | | | | |
| 100 | 9-1 | 9-5 | 9-3 | 9-2 | 9-5 | 9-5 | 9-0 | 9-4 | 9-5 | 100 |
| 99 | 9-0 | 9-4 | 9-2 | 9-1 | 9-4 | 9-4 | 8-11 | 9-3 | 9-4 | 99 |
| 98 | 8-11 | 9-3 | | 9-0 | 9-3 | 9-3 | 8-11 | 9-2 | 9-3 | 98 |
| 97 | 8-11 | 9-2 | 9-1 | 8-11 | 9-2 | 9-2 | 8-9 | 9-1 | 9-2 | 97 |
| 96 | 8-9 | 9-1 | 9-0 | 8-10 | | 9-1 | 8-8 | 9-0 | 9-1 | 96 |
| 95 | 8-8 | 9-0 | 8-11 | 8-9 | 9-1 | 9-0 | 8-7 | 8-11 | 9-0 | 95 |
| 94 | 8-7 | 8-11 | 8-10 | 8-8 | 9-0 | 8-11 | 8-6 | | 8-11 | 94 |
| 93 | 8-6 | 8-10 | 8-9 | 8-7 | 8-11 | 8-10 | 8-5 | 8-10 | 8-10 | 93 |
| 92 | 8-5 | 8-9 | 8-8 | 8-6 | 6-10 | 8-9 | 8-4 | 8-9 | 8-9 | 92 |
| 91 | | 8-8 | 8-7 | 8-5 | 8-9 | 8-8 | 8-3 | 8-8 | 8-8 | 91 |
| 90 | 8-4 | 8-7 | 8-6 | 8-4 | 8-8 | 8-7 | 8-2 | 8-7 | 8-7 | 90 |
| 89 | 8-3 | 8-6 | 8-5 | 8-3 | 8-7 | 8-6 | 8-1 | 8-6 | 8-6 | 89 |
| 88 | 8-2 | 8-5 | 8-4 | | 8-6 | | 8-0 | 8-5 | 8-5 | 88 |
| 87 | 8-1 | 8-4 | 8-3 | 8-2 | 8-5 | 8-5 | 7-11 | 8-4 | 8-4 | 87 |
| 86 | 8-0 | 8-3 | 8-2 | 8-1 | 8-4 | 8-4 | | 8-3 | 8-3 | 86 |
| 85 | 7-11 | 8-2 | 8-1 | 8-0 | 8-3 | 8-3 | 7-10 | 8-2 | 8-2 | 85 |
| 84 | 7-10 | 8-1 | 8-0 | 7-11 | 8-2 | 8-2 | 7-9 | 8-1 | 8-1 | 84 |
| 83 | 7-9 | 8-0 | 7-11 | 7-10 | 8-1 | 8-1 | 7-8 | 8-0 | 8-0 | 83 |
| 82 | 7-8 | 7-11 | 7-10 | 7-9 | 8-0 | 8-0 | 7-7 | 7-11 | 7-11 | 82 |
| 81 | 7-7 | | 7-9 | 7-8 | 7-11 | 7-11 | 7-6 | 7-10 | | 81 |
| 80 | 7-6 | 7-10 | 7-8 | 7-7 | 7-10 | 7-10 | 7-5 | 7-9 | 7-10 | 80 |
| 79 | 7-5 | 7-9 | 7-7 | 7-6 | 7-9 | 7-9 | 7-4 | 7-8 | 7-9 | 79 |
| 78 | 7-4 | 7-8 | | 7-5 | 7-8 | 7-8 | 7-3 | 7-7 | 7-8 | 78 |
| 77 | 7-3 | 7-7 | 7-6 | 7-4 | 7-7 | 7-7 | 7-2 | 7-6 | 7-7 | 77 |
| 76 | 7-2 | 7-6 | 7-5 | 7-3 | | 7-6 | 7-1 | 7-5 | 7-6 | 76 |
| 75 | 7-1 | 7-5 | 7-4 | 7-2 | 7-6 | 7-5 | 7-0 | 7-4 | 7-5 | 75 |
| 74 | 7-0 | 7-4 | 7-3 | 7-1 | 7-5 | 7-4 | 6-11 | | 7-4 | 74 |
| 73 | 6-11 | 7-3 | 7-2 | 7-0 | 7-4 | 7-3 | 6-10 | 7-3 | 7-3 | 73 |
| 72 | 6-10 | 7-2 | 7-1 | 6-11 | 7-3 | 7-2 | 6-9 | 7-2 | 7-2 | 72 |
| 71 | | 7-1 | 7-0 | 6-10 | 7-2 | 7-1 | 6-8 | 7-1 | 7-1 | 71 |
| 70 | 6-9 | 7-0 | 6-11 | 6-9 | 7-1 | 7-0 | 6-7 | 7-0 | 7-0 | 70 |
| 69 | 6-8 | 6-11 | 6-10 | 6-8 | 7-0 | 6-11 | 6-6 | 6-11 | 6-11 | 69 |
| 68 | 6-7 | 6-10 | 6-9 | | 6-11 | | 6-5 | 6-10 | 6-10 | 68 |
| 67 | 6-6 | 6-9 | 6-8 | 6-7 | 6-10 | 6-10 | 6-4 | 6-9 | 6-9 | 67 |
| 66 | 6-5 | 6-8 | 6-7 | 6-6 | 6-9 | 6-9 | | 6-8 | 6-8 | 66 |
| 65 | 6-4 | 6-7 | 6-6 | 6-5 | 6-8 | 6-8 | 6-3 | 6-7 | 6-7 | 65 |
| 64 | 6-3 | 6-6 | 6-5 | 6-4 | 6-7 | 6-7 | 6-2 | 6-6 | 6-6 | 64 |
| 63 | 6-2 | 6-5 | 6-6 | 6-3 | 6-6 | 6-6 | 6-1 | 6-5 | 6-5 | 63 |
| 62 | 6-1 | 6-4 | 6-3 | 6-2 | 6-5 | 6-5 | 6-0 | 6-4 | 6-4 | 62 |
| 61 | 6-0 | | 6-2 | 6-1 | 6-4 | 6-4 | 5-11 | 6-3 | | 61 |
| 60 | 5-11 | 6-3 | 6-1 | 6-0 | 6-3 | 6-3 | 5-10 | 6-2 | 6-3 | 60 |
| 59 | 5-10 | 6-2 | 6-0 | 5-11 | 6-2 | 6-2 | 5-9 | 6-1 | 6-2 | 59 |
| 58 | 5-9 | 6-1 | | 5-10 | 6-1 | 6-1 | 5-8 | 6-0 | 6-1 | 58 |
| 57 | 5-8 | 6-0 | 5-11 | 5-9 | 6-0 | 6-0 | 5-7 | 5-11 | 6-0 | 57 |
| 56 | 5-7 | 5-11 | 5-10 | 5-8 | | 5-11 | 5-6 | 5-10 | 5-11 | 56 |
| 55 | 5-6 | 5-10 | 5-9 | 5-7 | 5-11 | 5-10 | 5-5 | 5-9 | 5-10 | 55 |
| 54 | 5-5 | 5-9 | 5-8 | 5-6 | 5-10 | 5-9 | 5-4 | | 5-9 | 54 |
| 53 | 5-4 | 5-8 | 5-7 | 5-5 | 5-9 | 5-8 | 5-3 | 5-8 | 5-8 | 53 |
| 52 | 5-3 | 5-7 | 5-6 | 5-4 | 5-8 | 5-7 | 5-2 | 5-7 | 5-5 | 52 |
| 51 | | 5-6 | 5-5 | 5-3 | 5-7 | 5-6 | 5-1 | 5-6 | 5-6 | 51 |
| 50 | 5-2 | 5-5 | 5-4 | 5-2 | 5-6 | 5-5 | 5-0 | 5-5 | 5-5 | 50 |
| 49 | 5-1 | 5-4 | 5-3 | 5-1 | 5-5 | 5-4 | 4-11 | 5-4 | 5-4 | 49 |
| 48 | 5-0 | 5-3 | 5-2 | | 5-4 | | 4-10 | 5-3 | 5-3 | 48 |

## College Men
### Bar Snap for Distance (Continued)

| Score | Tall Slender | Tall Medium | Tall Heavy | Medium Slender | Medium Medium | Medium Heavy | Short Slender | Short Medium | Short Heavy | Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | Height-Weight Divisions | | | | | | | | | |
| | Distance in Feet and Inches | | | | | | | | | |
| 47 | 4-11 | 5-2 | 5-1 | 5-0 | 5-4 | 5-3 | 4-9 | 5-2 | 5-2 | 47 |
| 46 | 4-10 | 5-1 | 5-0 | 4-11 | 5-2 | 5-2 | | 5-1 | 5-1 | 46 |
| 45 | 4-9 | 5-0 | 4-11 | 4-10 | 5-1 | 5-1 | 4-8 | 5-0 | 5-0 | 45 |
| 44 | 4-8 | 4-11 | 4-10 | 4-9 | 5-0 | 5-0 | 4-7 | 4-11 | 4-11 | 44 |
| 43 | 4-7 | 4-10 | 4-9 | 4-8 | 4-11 | 4-11 | 4-6 | 4-10 | 4-10 | 43 |
| 42 | 4-6 | 4-9 | 4-8 | 4-7 | 4-10 | 4-10 | 4-5 | 4-9 | 4-9 | 42 |
| 41 | 4-5 | | 4-7 | 4-6 | 4-9 | 4-9 | 4-4 | 4-8 | | 41 |
| 40 | 4-4 | 4-8 | 4-6 | 4-5 | 4-8 | 4-8 | 4-3 | 4-7 | 4-8 | 40 |
| 39 | 4-3 | 4-7 | 4-5 | 4-4 | 4-7 | 4-7 | 4-2 | 4-6 | 4-7 | 39 |
| 38 | 4-2 | 4-6 | | 4-3 | 4-6 | 4-6 | 4-1 | 4-5 | 4-6 | 38 |
| 37 | 4-1 | 4-5 | 4-4 | 4-2 | 4-5 | 4-5 | 4-0 | 4-4 | 4-5 | 37 |
| 36 | 4-0 | 4-4 | 4-3 | 4-1 | | 4-4 | 3-11 | 4-3 | 4-4 | 36 |
| 35 | 3-11 | 4-3 | 4-2 | 4-0 | 4-4 | 4-3 | 3-10 | 4-2 | 4-3 | 35 |
| 34 | 3-10 | 4-2 | 4-1 | 3-11 | 4-3 | 4-2 | 3-9 | | 4-2 | 34 |
| 33 | 3-9 | 4-1 | 4-0 | 3-10 | 4-2 | 4-1 | 3-8 | 4-1 | 4-1 | 33 |
| 32 | 3-8 | 4-0 | 3-11 | 3-9 | 4-1 | 4-0 | 3-7 | 4-0 | 4-0 | 32 |
| 31 | | 3-11 | 3-10 | 3-8 | 4-0 | 3-11 | 3-6 | 3-11 | 3-11 | 31 |
| 30 | 3-7 | 3-10 | 3-9 | 3-7 | 3-11 | 3-10 | 3-5 | 3-10 | 3-10 | 30 |
| 29 | 3-6 | 3-9 | 3-8 | 3-6 | 3-10 | 3-9 | 3-4 | 3-9 | 3-9 | 29 |
| 28 | 3-5 | 3-8 | 3-7 | | 3-9 | | 3-3 | 3-8 | 3-8 | 28 |
| 27 | 3-4 | 3-7 | 3-6 | 3-5 | 3-8 | 3-8 | 3-2 | 3-7 | 3-7 | 27 |
| 26 | 3-3 | 3-6 | 3-5 | 3-4 | 3-7 | 3-7 | | 3-6 | 3-6 | 26 |
| 25 | 3-2 | 3-5 | 3-4 | 3-3 | 3-6 | 3-6 | 3-1 | 3-5 | 3-5 | 25 |
| 24 | 3-1 | 3-4 | 3-3 | 3-2 | 3-5 | 3-5 | 3-0 | 3-4 | 3-4 | 24 |
| 23 | 3-0 | 3-3 | 3-2 | 3-1 | 3-4 | 3-4 | 2-11 | 3-3 | 3-3 | 23 |
| 22 | 2-11 | 3-2 | 3-1 | 3-0 | 3-3 | 3-3 | 2-10 | 3-2 | 3-2 | 22 |
| 21 | 2-10 | | 3-0 | 3-11 | 3-2 | 3-2 | 2-9 | 3-1 | | 21 |
| 20 | 2-9 | 3-1 | 2-11 | 2-10 | 3-1 | 3-1 | 2-8 | 3-0 | 3-1 | 20 |
| 19 | 2-8 | 3-0 | 2-10 | 2-9 | 3-0 | 3-0 | 3-7 | 2-11 | 3-0 | 19 |
| 18 | 2-7 | 2-11 | | 2-8 | 2-11 | 2-11 | 2-6 | 2-10 | 2-11 | 18 |
| 17 | 2-6 | 2-10 | 2-9 | 2-7 | 2-10 | 2-10 | 2-5 | 2-9 | 2-10 | 17 |
| 16 | 2-5 | 2-9 | 2-8 | 2-6 | | 2-9 | 2-4 | 2-8 | 2-9 | 16 |
| 15 | 2-4 | 2-8 | 2-7 | 2-5 | 2-9 | 2-8 | 2-3 | 2-7 | 2-8 | 15 |
| 14 | 2-3 | 2-7 | 2-6 | 2-4 | 2-8 | 2-7 | 2-2 | | 2-7 | 14 |
| 13 | 2-2 | 2-6 | 2-5 | 2-3 | 2-7 | 2-6 | 2-1 | 2-6 | 2-6 | 13 |
| 12 | 2-1 | 2-5 | 2-4 | 2-2 | 2-6 | 2-5 | 2-0 | 2-5 | 2-5 | 12 |
| 11 | | 2-4 | 2-3 | 2-1 | 2-5 | 2-4 | 1-11 | 2-4 | 2-4 | 11 |
| 10 | 2-0 | 2-3 | 2-2 | 2-0 | 2-4 | 2-3 | 1-10 | 2-3 | 2-3 | 10 |
| 9 | 1-11 | 2-2 | 2-1 | 1-11 | 2-3 | 2-2 | 1-9 | 2-2 | 2-2 | 9 |
| 8 | 1-10 | 2-1 | 2-0 | | 2-2 | | 1-8 | 2-1 | 2-1 | 8 |
| 7 | 1-9 | 2-0 | 1-11 | 1-10 | 2-1 | 2-1 | 1-7 | 2-0 | 2-0 | 7 |
| 6 | 1-8 | 1-11 | 1-10 | 1-9 | 2-0 | 2-0 | | 1-11 | 1-11 | 6 |
| 5 | 1-7 | 1-10 | 1-9 | 1-8 | 1-11 | 1-11 | 1-6 | 1-10 | 1-10 | 5 |
| 4 | 1-6 | 1-9 | 1-8 | 1-7 | 1-10 | 1-10 | 1-5 | 1-9 | 1-9 | 4 |
| 3 | 1-5 | 1-8 | 1-7 | 1-6 | 1-9 | 1-9 | 1-4 | 1-8 | 1-8 | 3 |
| 2 | 1-4 | 1-7 | 1-6 | 1-5 | 1-8 | 1-8 | 1-3 | 1-7 | 1-7 | 2 |
| 1 | 1-3 | | 1-5 | 1-4 | 1-7 | 1-7 | 1-2 | 1-6 | | 1 |

The plan presented here seems reasonable from every point of view, but until it is accepted as standard for this project, we shall not be able to work toward a uniform scheme of presentation.

4. It is practically impossible to expect one individual or set of individuals in any institution to formulate tests and collect data in more than one division of the six major headings. Tests under each of these divisions must be set up according to a definite plan, either the one which has already been outlined or another agreed upon by the Association.

5. In attempting to outline our work for the future two courses of action are open:

*a*) The gradual completion of all skill tests in each of the six major divisions and subdivisions by alloting various tests to members in colleges throughout the country. Next, the gradual completion (one by one) of the other phases of the program—rules, team strategy, and social attitudes.

*b*) The gradual completion of the entire program by completing the four phases of each activity in the major divisions. For example, take the case of division VI, Team Games. Tests in the various phases of the games listed under this heading might be completed before another division was undertaken.

Your subcommittee would suggest method (*a*), *first*, because we have made a start in this direction, *second*, because we are still in the process of evolution in rules and strategy, and *third*, we shall learn much in the next few years regarding the measurement of social attitudes.

## Part VI

## Report of Subcommittee V
## Establishing Appropriate Administration Standards

By Professor Frank Lloyd, Ph.D.
*New York University*

### WORK IN THE PROCESS OF COMPLETION

*a*) The problem has been outlined under main logical headings. Each heading has been broken down into sub-headings. This analysis was used in order to establish the scope of the problem and to make available a classification under which materials might be organized.

*b*) The existing research pertaining to this problem is now being collected and organized under the main and sub-headings referred to above.

### PLANS FOR THE FUTURE

It is necessary that a complete bibliographical and literature-analytical study be made in order to benefit by the suggestions which have been made for standards in this field.

Where research of a reliable nature does not exist, it will be necessary to use expert personal opinion for the establishment of these standards. This will be done through personal correspondence by the chairman, with a selected group of individuals who have shown their ability in the fields of practice and literature or both in connection with this problem.

When these suggested lists of standards have been established, they will be submitted to a limited number of the members of the College Physical Education Association. The cooperating members will be asked to critically evaluate the standards, indicating their agreement or disagreement. Where they disagree they will be asked to suggest changes. There will be a further opportunity for the addition of other standards.

It is requested that all the members of the College Physical Education Association send to Professor Frank S. Lloyd, School of Education, New York University, any research which has been conducted in their institution with which they are familiar, which is related to this problem, and further, any personal materials which they have presented on this subject. In both cases, full credit will be given to the authors. Such cooperation will greatly facilitate not only the work of this committee, but will augment the value of the ultimate report.

The members of the Association who are selected to evaluate critically the standards to be established are asked to take this responsibility when the material comes to their desk.

It is the feeling of the Chairman of this Committee that the scope of the function of the committee is limited to bibliographical research and literature-analysis research. It is felt that the Committee should definitely avoid the establishment of pieces of research beyond the fields indicated above. By the nature of the Committee's position, it does not feel that it can do more than present to the field work completed and a logical analysis of the problem. Further, they feel they can be of use by organizing the existing research and literature so that the members of the organization and others may have presented before them in a systematic way a complete bird's-eye-view of the field. The Committee feels that it can serve best by compiling existing material and through its organization, stimulate research of others.

## Part VII

## Recommendations

1. The Chairman wishes to recommend that the Committee be continued as heretofore with the present five subdivisions with the understanding that all of the work will be closely correlated as a unified whole.

2. It is strongly urged that, in view of the very great importance of

the study, all members of the Association give serious thought to it and from time to time submit to the General Chairman or to the Subcommittee Chairmen, appropriate suggestions that might help in carrying on the work more effectively. Any research studies carried on in other institutions that might be used effectively in furthering the work of any subdivision will be gratefully received by the committee members.

3. It is recommended that Dr. Cozens' proposal for a uniform plan of procedure in the various achievement tests be adopted by the Association (see minutes of the business meeting).

Respectfully submitted,

C. L. Brownell
F. W. Cozens
Frank Lloyd
Frank L. Oktavec
Assisting Dr. Oktavec:
Mr. Karl Bookwalter, Indiana University
Mr. M. A. Clevett, George Williams College
William R. La Porte, *Chairman*

# Physique of Sixteen-Year-Old College Freshmen

By Paul C. Phillips, M.D.

*Formerly Professor of Hygiene and Physical Education at Amherst College*

IN A STUDY which the writer recently made to determine, if possible, the optimum age for entering college he discovered facts bearing on the physical development and health of boys and girls who entered at sixteen years which may be of interest to readers of the Research Quarterly.

It should be stated at the outset that the study covered, in addition to growth and health, morals, scholarship, friendships, student activities, and success in after-life; and that the conclusion of the study was that, *in general,* boys and girls should be encouraged *to enter college in their intellectual stride,* i.e., to enter at sixteen or seventeen *if ready.*

Naturally physical development and health are major considerations in the minds of parents and teachers in determining whether a student should go to college when fitted. They are also the most frequent causes for postponing their entrance. But so much hearsay has entered into the decision that it seemed desirable to base the judgments on some scientific facts.

## GROWTH

Dr. W. Townsend Porter's classic study of St. Louis school children in 1892 brought out for the first time the fact that between the ages of six and seventeen years the mentally precocious children are taller, heavier, and of greater chest girth than the average students of their age, and that the dullards are smaller than the average. While there seems to be no close correlation in his figures between physical and mental development, yet there is a marked *tendency* for the brighter students, taken *en masse,* to be superior physically to those of mediocre or inferior mentality. It was one of the main objects of this study to find out whether this tendency of the mentally accelerated student to be accelerated physically held up to maturity.

The graph herewith indicates for height that it does. It is here stated for the first time.

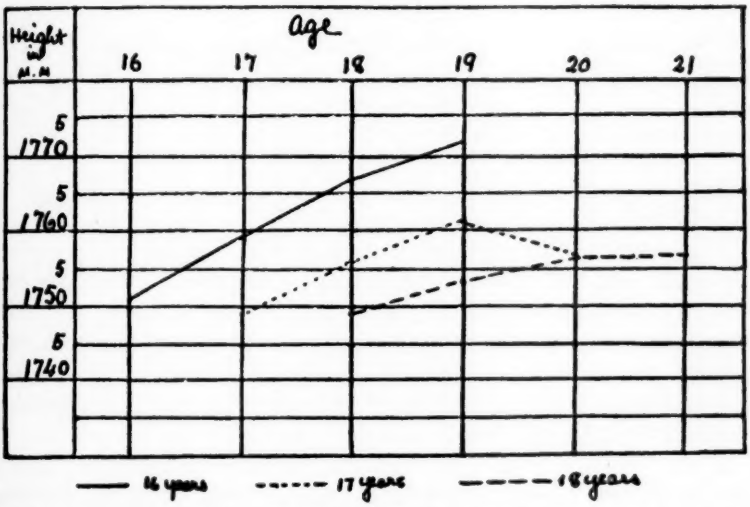
This in itself is astounding. It seems to violate all the laws of growth derived from students unclassified by scholastic grades. These Amherst College students who entered in 1921-31 at an average age of sixteen years, seven and one-half months, were physically a year or more in advance of the norm for their age and the equals of their seventeen-

and eighteen-year-old classmates. Only in the items of lung capacity and total strength did the other graphs show them inferior to their elders at entrance—and then only slightly.

The comparison was carried through to the nineteenth year to determine whether the so-called physical precocity of the 16-year entrants terminated in freshman year or continued. The results showed

GRAPH I

GROWTH IN STATURE OF BOYS WHO ENTERED COLLEGE AT SIXTEEN, SEVENTEEN, AND EIGHTEEN YEARS. HEIGHT GIVEN AT EACH YEAR OF AGE UP TO JUNIOR YEAR.




The sixteen-year-old entrants were slightly taller at the start and gained steadily until junior year when growth was approximately complete.

that these boys who entered at 16 kept on growing even more than those who entered at 17 and 18. See table on page 28. The superiority of the 17-year entrants to the 18 should also be noted. The data from three freshman classes at Wesleyan University between 1924 and 1927 contain too few students under 17 years to make a fair average. If, however, we compare those who entered at 17, 18, and 19 where we have respectively 112, 185, and 128 students, we find again the tendency of the younger entrants to excel the older physically.

Among college girls also we find that accelerated mental and physical development go hand in hand, if not actually correlated. The girls who enter Mt. Holyoke College at sixteen are as tall, are heavier, and are of equal chest depth and lung capacity to those who enter at seventeen and eighteen years.

It is not surprising that girls of sixteen equal or slightly exceed in

stature those older, as full height is well nigh attained by them during the sixteenth year. But that *en masse* they should surpass their older mates from two to six and one-half pounds in weight is remarkable. Statistics compiled from thousands of high school pupils show the reverse of this: a gain of about three pounds from sixteen to eighteen years. The indication is that the girls who come to Mt. Holyoke are physically more mature than others of the same age in the high school whence they came. These may not come to college and are generally to be found in the lower high school classes.

| | 16-yr. entrants at 19 yrs., 1/2 mo. | 17-yr. entrants at 18 yrs., 11 1/5 mos. | 18-yr. entrants at 18 yrs., 9 1/5 mos. |
|---|---|---|---|
| Weight in kilos ..... | 69.3 | 67.0 | 65.8 |
| Height in m.m. ..... | 1772 | 1761 | 1753 |
| Chest normal m.m. ..... | 927 | 918 | 910 |
| Lung capacity in m.m. ..... | 466 | 460 | 437 |
| Total strength .... | 699 | 677 | 628 |

The measurements made in 1923 by Bird T. Baldwin of 594 gifted California boys and girls between 7 and 15 years of age indicate that the gifted group is, as a whole, physically superior to the groups used for comparison. Inasmuch as these gifted children are the ones who reach college, sometimes under 16 years, the inference is justifiable that the students who come to college young because of mental acceleration are also physically superior.

If the record of intelligence quotients instead of scholarship grades is our yardstick, the same result is obtained. Hollingsworth has reported that the children who rate highest are physically superior to others.

We can only surmise at present what the cause of this physical acceleration may be. It cannot be ascribed to the marked increase in stature and weight of our preparatory school (not high school) and college students which has taken place in the last two generations; an increase which has gone on steadily while that of our general population has kept nearly stationary. The figures in our tables are from college students of the same periods. The accelerations are within their own group which is fairly homogeneous in race, social status, geographical distribution, and environmental conditions. Possibly our intellectuals are coming from a taller strain, our native or old American stock, preëminently Nordic, which Gordon T. Bowles states has been increasing in size since 1860.

## FUNCTIONAL ABILITY

But physical ability is indicated not alone by increase in size but by functional ability, strength, speed, skill, alertness, etc. We have com-

pared this ability in freshmen entering at sixteen, seventeen, and eighteen years by use of their grades in physical education. These are based on a varied program of calisthenics, apparatus work, boxing, wrestling, swimming, track and field, tennis, basketball, and other competitive sports. These tests show that the sixteen-year-old students are, at entrance and through their three years of required work, on a par with the boys entering at seventeen and eighteen.

## HEALTH

It is conceivable that students who enter college young may, notwithstanding normal physical development, functional ability, and organic vigor, be more susceptible to disease or less able to combat it once it is acquired. The infirmary records do not show it. The average days' detention for the decade 1921-31 was: for the 16-year-old entrants, 3 days; 17-year, 2.9 days; 18-year, 3.4.

## LONGEVITY

It may be contended that while boys who enter college quite young seem to have no less organic vigor and suffer no more illness than their elders they do not live as long, the implication being that coming to college so young was a contributing factor.

Longevity is largely a matter of heredity; environmental conditions, taken by and large, influence it but little. But let us first ascertain the facts. Do boys who enter college at sixteen or seventeen have a lower expectation of life than those who enter older? If we find that they do, is it a general law of human life that those who mature young, die young, or is their early demise due to intellectual crowding?

Dr. L. I. Dublin, the eminent actuary of the Mutual Life Insurance Company, was kind enough to make for this study a mortality table of about twenty-five hundred students who graduated at Amherst 1870 to 1905. It was impossible to get enough entrants of sixteen, seventeen, and eighteen years of age for a reliable table, so the men who entered at eighteen years, two months and under were compared with those who entered older. There were about four times as many in the older group—so this table compares the youngest fifth of the class with the older four-fifths.

Using the entire twenty-five hundred, the mortality was only about 80 per cent of that expected by the "American Men Table."

Dr. Dublin's summary is as follows: "On the whole the results tend to confirm your impression that Amherst men who graduate at the older ages have a lower mortality than the younger men . . . It is worthy of note that at ages under forty-five the mortality of the younger men is better than that of the older men. The reverse is true at ages forty-five and over." Asked for his explanation of these facts, thinking it

might be a law of nature for those who matured early mentally and physically to die earlier, he wrote:

"Your explanation of the difference in mortality between men who graduate at older ages and the younger graduates is a plausible one."

Dr. Raymond Pearl in *The Rate of Living* states in his summary: "All the evidence presented in this book converges to the conclusion that *in general* the duration of life (in flies) varies inversely as the rate of energy expenditure during its continuance. *In short, the length of life depends inversely on the rate of living.*"

He finds this law applicable to many of the lower forms of life. As to its applicability to man as a solution for Dr. Dublin's findings, he writes: "I believe that this is a factor in the case, but should hesitate to affirm that it wholly accounts for your findings."

If it should be found that the greater mortality of those after forty-five who enter college young is due to the fact that they succumb earlier to degenerative diseases, which are the principal causes of death after that age, then we must inquire further into the stock whence they came; a stock which has a lower mortality to forty-five and a somewhat higher one afterwards—but even then 11 per cent below the mortality for all men.

In view of all the facts brought out, is it not wiser to permit, even encourage, the bright boy and girl to proceed at their optimum educational speed in order that they may enter on their life work as early as possible? Their health records in college and their low mortality rates up to forty-five seem to indicate that it is not early entrance to college but the stock from which they came that makes them less long-lived than their fellows.

The records of these younger students in after life, if the number in *Who's Who* is any criterion, indicate that 50 per cent more of them become eminent than those who entered college after eighteen years. The statistics are from graduates 1889-99.

Then why not let them go on! As Pearl says, "The essence of life depends on its dynamics and not on its statics."

# A Simple Method of Detecting Abnormal Hearts by the Use of the Pulse-Ratio Test*

By Henry Sievers

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Tuttle and Wells[1] showed quite conclusively that in the case of the normal heart the increase in rate caused by exercise is directly proportional to the intensity of the exercise, and that the form of the curve representing the relationship between heart rate and exercise intensity is rectilinear. It is evident that if abnormal hearts do not conform to this principle, a simple method for detecting them is provided. The object of the investigation herein reported is to determine the nature of the response of the abnormal hearts to exercises of graded intensities.

## THE METHOD

The basis of the method is the pulse-ratio, which is found by dividing the total pulse for 2 minutes after a known amount of standard exercise by the resting rate for 1 minute. The standard exercise consists of stepping on and off a stool 13 inches high at some selected rate for a period of 1 minute. Tuttle and Wells[1] reasoned that if two pulse-ratios and the amount of exercise corresponding to each were known, then one could calculate by the rectilinear formula the pulse-ratio for any amount of exercise between those used experimentally, provided the increase in heart rate was directly proportional to the intensity of the exercise and the form of the curve representing this relationship was rectilinear. The procedure was as follows: An exercise, for example 18 steps for 1 minute, was selected which gave a pulse-ratio slightly above 2.00. Then a more strenuous exercise was given, say 40 steps for 1 minute, which gave a pulse-ratio materially greater than the first, but well within the limits of the heart. Now if the increase in heart rate is directly proportional to the intensity of the exercise, and the relationship is rectilinear, one can mathematically determine the pulse-ratio corresponding to any exercise between 18 and 40 steps. This is

* From the Department of Physiology, College of Medicine, State University of Iowa.

[1] W. W. Tuttle and George Wells, "The Response of the Normal Heart to Exercises of Graded Intensity," *Arbeits-physiologie*, 4 (1931), 519-526.

done by use of the formula, $r = \frac{r_2 - r_1}{e_2 - e_1}(e - e_1) + r_1$. This formula is derived from the straight line equation $\frac{y_0 - y_1}{x_0 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$. In the derived formula,

$r$ = any desired ratio.
$r_1$ = the ratio corresponding to $e_1$.
$r_2$ = the ratio corresponding to $e_2$.
$e$ = number of steps of exercise corresponding to $r$.
$e_1$ = the less intense exercise in steps.
$e_2$ = the more intense exercise in steps.

Suppose that 18 steps of the standard exercise produce a pulse-ratio of 2.18, and that 40 steps increase it to 2.66. By the formula, then, one can calculate the pulse-ratio for 25 steps, which is 2.33. If the assumption is correct that the increase in heart rate is directly proportional to the intensity of the exercise, and that the relationship is rectilinear, then 25 steps of the exercise when actually performed should give a pulse-ratio of 2.33. In 124 experiments this relationship was found actually to exist. In 78 per cent of the experiments the difference between calculated and experimental ratio was no more than .05 of a pulse-ratio and in no case was it greater than .08 of a pulse-ratio. These differences were accounted for on the basis of error in pulse counting. For the entire group of experiments the coefficient of correlation was .929 $\pm$ .008.

During the course of the medical examination of freshmen at the State University of Iowa, thirty-two students were reported as having abnormal hearts. This group was used as a basis for the experiment herein reported.

## THE DATA

Data were collected from 32 University freshmen reported as having abnormal hearts. The physician's report of these cases at the time of the examination was as follows: 6 cases of functional murmurs; 16 cases of organic lesion, in which there was definite evidence of decompensation; 6 cases of organic lesion, but no signs of heart failure; 2 cases of neurogenic hearts; and 2 cases on which there was lack of agreement as to whether they belonged to class 2 or 3. Each case was examined by the pulse-ratio test upon two different occasions. Pulse-ratios for light, heavy, and intermediate exercise were secured by the technique described above. Pulse-ratios for intermediate exercise, in addition to being determined experimentally, were calculated mathematically, by means of the formula given above.

*Group I. Functional Murmurs.*—This group consists of 6 cases. The data collected from them are shown in Table I. The data show that in 1 case the difference between the calculated and experimental ratio is .01; in 1 case .02; in 1 case .03; in 1 case .04; and in 2 cases .06.

In order to reënforce the results of the first data collected from this group, the experiment was repeated two months later. At this time the results were in complete accord with the first experiment. These data are interpreted as indicating that functional murmurs cannot be detected by means of the pulse-ratio technique. Furthermore, the physician in charge placed no restriction on these individuals as to their participation in exercise. In other words, for all practical purposes they were classed as "fit for exercise" by both the pulse-ratio technique and the examining physician.

*Group II. The Organic Lesions.*—This group consists of 16 cases who were diagnosed by the examining physician as having definite organic lesions. The data collected from this group by means of the pulse-ratio technique are shown in Table II. Attention is called at this time to the differences between the calculated and experimental ratios. In the first experiment this difference was greater than .08 of a pulse-ratio, which is considered by Tuttle and Wells[2] as the upper limit for normal cases. In fact, only 1 case, subject 10, had a difference smaller than .13 pulse-ratio. It should be added that subject 10 was diagnosed as a mild case of aortic stenosis.

A repetition of the experiment two months later gave results which were in complete accord with the first examination.

These cases were pronounced by the examining physician as unfit for participation in strenuous exercise. The diagnosis by use of the pulse-ratio test was in complete accord with that of the physician.

*Group III. Compensated Organic Lesions.*—This group contains six cases of organic lesions which are compensated, as diagnosed by the examining physician. The data are shown in Table III. Upon the first examination, all of them were found to fall within the normal range, as shown by the pulse-ratio test. The examination two months later corroborated the findings of the first. The physician felt that these individuals need not be restrained from participating in exercise. The results of the pulse-ratio technique were in agreement with the recommendations of the examining physician.

*Group IV. The Neurogenic Lesions.*—This group contains two subjects. The data collected from them are shown in Table IV. These subjects were diagnosed as being organically normal but of a nervous nature. The physician placed no restrictions on their activity. The first pulse-ratio test also placed them in the normal group and the second examination gave similar results. In this group the findings of the pulse-ratio technique were in complete accord with the diagnosis of the physician.

*Group V. Questionable Cases.*—Two subjects are placed in this group. The results of the pulse-ratio examination are shown in Table V.

[2] *Ibid.*

According to the first pulse-ratio test these cases had definite non-compensated organic lesions. The second examination gave results exactly like the first. The results of the first physical examination were conflicting and uncertain. Consultation among three physicians was held and they failed to agree on a diagnosis, except that the hearts were not normal. On the basis of the pulse-ratio test these individuals have definite non-compensated organic lesions. It is hoped that this test will be of advantage in clarifying cases of this group. Due to the disagreement in diagnosis, conclusions cannot be drawn relative to the agreement in findings until further examinations are made.

*A Graphic Comparison of the Response of a Normal Heart with One Which has a Non-Compensated Organic Lesion.*—Fig. 1, *A* shows a graphic representation of the comparison between calculated and experimental ratios of a normal heart. Fig. 1, *B* is a graphic representation of the comparison of calculated and experimental ratios of the response of a heart with non-compensated organic lesions. It is evident that in the case of the normal heart the calculated and experimental ratios do not coincide within the limits of pulse counting, the difference being .27 pulse-ratio. Subject 16, Table II, is shown graphically in *A*, Fig. 1. In contrast, *B*, Fig. 1, is presented, which shows graphically the comparison of the calculated and experimental ratios of subject 5, Examination 2, Table I. In this case the difference is only .01 pulse-ratio.

## DISCUSSION

No attempt is being made to lay a basis upon which the technique used in this investigation should be substituted for the medical examination. The idea in mind is that if the pulse-ratio technique is reliable under the conditions previously pointed out, a valuable aid to inform us of the condition of the cardio-vascular system is available. This method may be used by the physician in his battery of tests for determining the condition of the heart. Perhaps the most useful contribution which it makes is in the field where it is necessary for non-medical people to obtain information concerning the condition of the heart. Let us call attention to the fact that many directors of exercise are called upon to obtain information concerning the cardio-vascular system. It seems evident that this furnishes the safest means for giving such information without medical training.

We do not want to be misunderstood on the question of the use of this technique. In no case do we want to leave the impression that the responsibility of physical diagnosis should be in the hands of anyone other than the physician. But it is reasonable to permit one who must select men for strenuous exercise to resort to such a technique. If there is an indication that some one apparently well otherwise has a heart lesion sufficient to be detected by the pulse-ratio technique, then this

discovery is worth while, since the lesion might otherwise be overlooked and not called to the attention of a physician.

Perhaps the physical director will find this technique most useful. By it, he may be able to locate those with pathological hearts, thus excluding such individuals from unprescribed exercise and at the same time placing them in the hands of the physician.

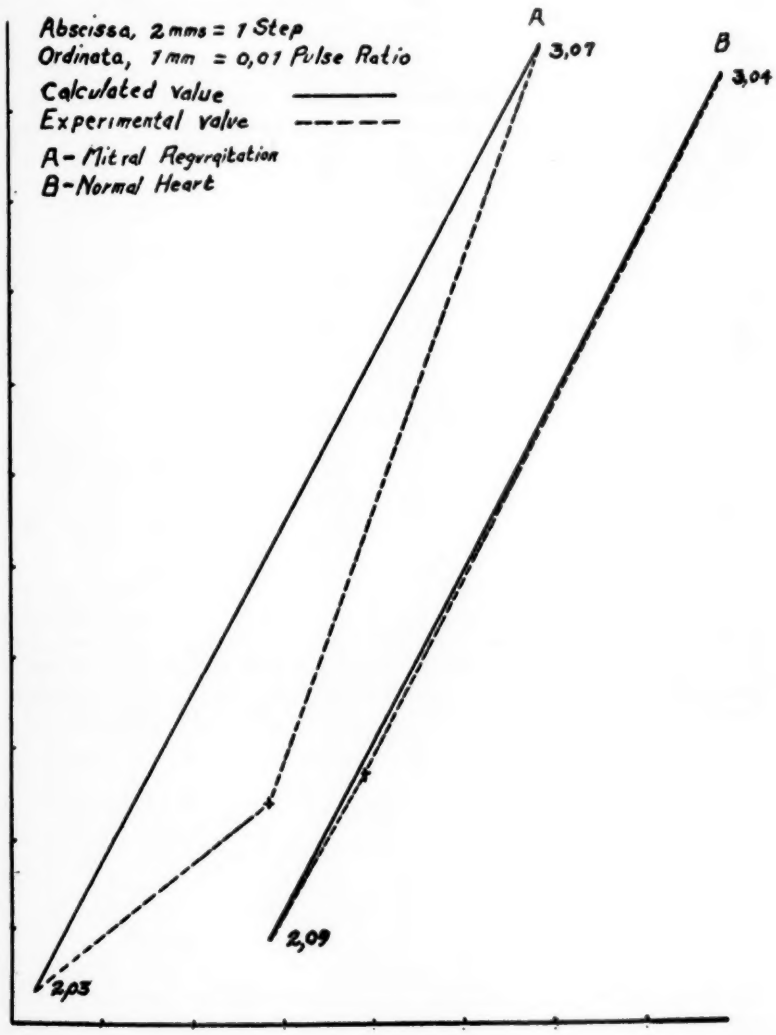


FIG. 1.—This figure shows a graphic comparison of the experimental and calculated ratio; *A*, non-compensated organic lesions and *B*, normal heart.

## CONCLUSION

On the basis of the data presented in this investigation, it may be concluded that the pulse-ratio technique is reliable in detecting non-compensated organic heart lesions.

This opportunity is taken to thank Professor W. W. Tuttle for directing this research and Dr. C. I. Miller for conducting and supervising the heart examinations.

TABLE I*

A COMPARISON OF CALCULATED AND EXPERIMENTAL PULSE-RATIO OF FUNCTIONAL MURMUR CASES

| Sub. No. | Normal Pulse | Light Ex. | Hvy. Ex. | P/R Lgt. Ex. | P/R Hvy. Ex. | Inter. Ex. | Exp. Ratio | Cal. Ratio | Diff. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *First Examination* | | | | | |
| 1 | 78 | 20 | 30 | 2.15 | 2.70 | 25 | 2.36 | 2.42 | .06 |
| 2 | 83 | 18 | 40 | 2.13 | 2.80 | 25 | 2.35 | 2.34 | .01 |
| 3 | 82 | 18 | 35 | 2.12 | 2.60 | 25 | 2.33 | 2.31 | .02 |
| 4 | 62 | 18 | 40 | 2.08 | 2.67 | 25 | 2.22 | 2.26 | .04 |
| 5 | 80 | 25 | 50 | 2.12 | 2.92 | 30 | 2.25 | 2.28 | .03 |
| 6 | 88 | 20 | 30 | 2.22 | 2.61 | 25 | 2.35 | 2.41 | .06 |
| | | | | *Second Examination* | | | | | |
| 1 | 72 | 20 | 30 | 2.31 | 2.59 | 25 | 2.45 | 2.44 | .01 |
| 2 | 80 | 18 | 40 | 2.15 | 2.96 | 25 | 2.38 | 2.40 | .02 |
| 3 | 98 | 12 | 40 | 2.05 | 2.52 | 25 | 2.20 | 2.25 | .05 |
| 4 | 78 | 15 | 40 | 2.02 | 2.52 | 25 | 2.19 | 2.22 | .03 |
| 5 | 74 | 25 | 50 | 2.09 | 3.04 | 30 | 2.27 | 2.28 | .01 |
| 6 | 80 | 20 | 30 | 2.20 | 2.65 | 25 | 2.46 | 2.43 | .03 |

* In this table, as well as in Tables II, III, IV, and V, the normal pulse given in column 2 is for one minute, while columns, 3, 4, 5, 6, and 7 stand respectively for $e_1$, $e_2$, $r_1$, $r_2$, and $e$, in the formula. Column 8 gives the value of $r$ determined experimentally, while column 9 gives the same thing calculated mathematically. Column 10 gives the difference between calculated and experimental values of $r$.

## TABLE II

A Comparison of Calculated and Experimental Pulse-Ratio of Non-Compensated Organic Lesion Cases

| Sub. No. | Normal Pulse | Light Ex. | Hvy. Ex. | P/R Lgt. Ex. | P/R Hvy. Ex. | Inter. Ex. | Exp. Ratio | Cal. Ratio | Diff. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *First Examination* | | | | | |
| 1 | 96 | 18 | 42 | 2.16 | 3.14 | 25 | 2.31 | 2.44 | .13 |
| 2 | 112 | 12 | 40 | 2.15 | 3.08 | 25 | 2.37 | 2.57 | .20 |
| 3 | 72 | 12 | 40 | 2.02 | 3.00 | 20 | 2.05 | 2.30 | .25 |
| 4 | 59 | 20 | 40 | 1.16 | 2.91 | 25 | 2.50 | 2.35 | .15 |
| 5 | 82 | 12 | 30 | 2.37 | 3.21 | 20 | 2.43 | 2.73 | .30 |
| 6 | 80 | 12 | 40 | 2.08 | 2.91 | 20 | 2.12 | 2.31 | .19 |
| 7 | 72 | 18 | 40 | 2.27 | 3.63 | 25 | 2.50 | 2.69 | .19 |
| 8 | 64 | 18 | 50 | 2.01 | 2.71 | 40 | 2.22 | 2.42 | .20 |
| 9 | 84 | 20 | 35 | 2.23 | 2.92 | 35 | 2.41 | 2.69 | .28 |
| 10 | 90 | 18 | 40 | 2.18 | 2.63 | 35 | 2.43 | 2.52 | .09 |
| 11 | 70 | 18 | 40 | 2.17 | 3.12 | 25 | 2.32 | 2.46 | .14 |
| 12 | 76 | 12 | 40 | 2.07 | 3.15 | 20 | 2.19 | 2.37 | .18 |
| 13 | 61 | 20 | 40 | 2.09 | 2.32 | 30 | 2.29 | 2.69 | .40 |
| 14 | 58 | 12 | 40 | 2.22 | 4.12 | 20 | 2.45 | 2.75 | .30 |
| 15 | 91 | 20 | 40 | 2.06 | 2.82 | 30 | 2.29 | 2.44 | .15 |
| 16 | 80 | 12 | 40 | 2.03 | 3.07 | 25 | 2.24 | 2.51 | .27 |
| | | | | *Second Examination* | | | | | |
| 1 | 82 | 18 | 42 | 2.23 | 2.80 | 25 | 2.19 | 2.39 | .20 |
| 2 | 84 | 12 | 40 | 2.42 | 3.52 | 30 | 2.91 | 3.12 | .21 |
| 3 | 78 | 12 | 40 | 2.12 | 3.07 | 20 | 2.17 | 2.38 | .21 |
| 4 | 64 | 20 | 40 | 2.12 | 3.06 | 25 | 2.16 | 2.33 | .17 |
| 5 | 84 | 12 | 30 | 2.30 | 2.98 | 20 | 2.34 | 2.59 | .25 |
| 6 | 86 | 12 | 40 | 2.07 | 2.61 | 20 | 2.07 | 2.22 | .15 |
| 7 | 75 | 18 | 40 | 2.25 | 3.58 | 25 | 2.44 | 2.67 | .23 |
| 8 | 70 | 18 | 50 | 2.15 | 2.70 | 40 | 2.34 | 2.52 | .18 |
| 9 | 80 | 20 | 35 | 2.22 | 2.97 | 30 | 2.51 | 2.72 | .21 |
| 10 | 94 | 18 | 40 | 2.10 | 2.71 | 30 | 2.28 | 2.42 | .14 |
| 11 | 71 | 18 | 40 | 2.09 | 3.11 | 25 | 2.25 | 2.41 | .16 |
| 12 | 85 | 12 | 40 | 2.06 | 3.10 | 20 | 2.15 | 2.35 | .20 |
| 13 | 56 | 18 | 40 | 2.21 | 3.57 | 25 | 2.35 | 2.63 | .28 |
| 14 | 71 | 12 | 40 | 2.09 | 3.91 | 20 | 2.23 | 2.61 | .38 |
| 15 | 80 | 20 | 40 | 2.05 | 3.95 | 30 | 2.26 | 2.50 | .24 |
| 16 | 88 | 12 | 40 | 2.02 | 3.03 | 25 | 2.23 | 2.49 | .26 |

## TABLE III

A Comparison of Calculated and Experimental Pulse-Ratio of Compensated Organic Lesion Cases

| Sub. No. | Normal Pulse | Light Ex. | Hvy. Ex. | P/R Lgt. Ex. | P/R Hvy. Ex. | Inter. Ex. | Exp. Ratio | Cal. Ratio | Diff. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *First Examination* | | | | | |
| 1 | 63 | 15 | 30 | 2.30 | 2.79 | 20 | 2.46 | 2.46 | .00 |
| 2 | 94 | 12 | 30 | 2.31 | 2.95 | 20 | 2.58 | 2.59 | .01 |
| 3 | 80 | 18 | 35 | 2.15 | 2.50 | 25 | 2.30 | 2.29 | .01 |
| 4 | 97 | 12 | 35 | 2.18 | 2.56 | 20 | 2.32 | 2.30 | .02 |
| 5 | 78 | 18 | 42 | 2.17 | 2.91 | 30 | 2.52 | 2.53 | .01 |
| 6 | 96 | 18 | 40 | 2.25 | 2.78 | 25 | 2.37 | 2.41 | .04 |
| | | | | *Second Examination* | | | | | |
| 1 | 70 | 15 | 30 | 2.19 | 2.71 | 20 | 2.30 | 2.36 | .06 |
| 2 | 90 | 12 | 30 | 2.33 | 3.00 | 20 | 2.62 | 2.62 | .00 |
| 3 | 79 | 18 | 35 | 2.12 | 2.53 | 25 | 2.32 | 2.28 | .04 |
| 4 | 93 | 12 | 35 | 2.07 | 2.62 | 20 | 2.29 | 2.25 | .04 |
| 5 | 89 | 18 | 42 | 2.05 | 2.83 | 30 | 2.43 | 2.43 | .00 |
| 6 | 93 | 18 | 40 | 2.24 | 2.88 | 25 | 2.41 | 2.44 | .03 |

## TABLE IV

A Comparison of Calculated and Experimental Pulse-Ratio of Neurogenic Cases

| Sub. No. | Normal Pulse | Light Ex. | Hvy. Ex. | P/R Lgt. Ex. | P/R Hvy. Ex. | Inter. Ex. | Exp. Ratio | Cal. Ratio | Diff. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *First Examination* | | | | | |
| 1 | 72 | 18 | 35 | 2.23 | 2.69 | 25 | 2.43 | 2.41 | .02 |
| 2 | 91 | 15 | 30 | 2.15 | 2.63 | 20 | 2.25 | 2.31 | .06 |
| | | | | *Second Examination* | | | | | |
| 1 | 75 | 18 | 35 | 2.25 | 2.76 | 25 | 2.46 | 2.46 | .00 |
| 2 | 81 | 12 | 30 | 2.13 | 2.50 | 30 | 2.28 | 2.29 | .01 |

## TABLE V

A Comparison of Calculated and Experimental Pulse-Ratio of Questionable Cases

| Sub. No. | Normal Pulse | Light Ex. | Hvy. Ex. | P/R Lgt. Ex. | P/R Hvy. Ex. | Inter. Ex. | Exp. Ratio | Cal. Ratio | Diff. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *First Examination* | | | | | |
| 1 | 72 | 18 | 40 | 2.15 | 3.00 | 25 | 2.19 | 2.41 | .22 |
| 2 | 70 | 18 | 40 | 2.25 | 3.14 | 25 | 2.48 | 2.62 | .14 |
| | | | | *Second Examination* | | | | | |
| 1 | 82 | 18 | 40 | 2.12 | 2.89 | 25 | 2.18 | 2.36 | .18 |
| 2 | 78 | 18 | 40 | 2.15 | 2.99 | 25 | 2.28 | 2.41 | .13 |

# Physical Education Background of College Students as a Factor in Determining the Content of the Required Physical Education Program

By Dorothy Beise

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MODERN education emphasizes the importance of adapting curricula to meet the needs and individual differences of students.* The application of this principle in any field of knowledge implies the necessity for determining previous experience of students in that field. For the field of physical education this means a familiarity with the previous playing experience of students. In other words, to make our physical education program sound, we need an analysis of the playing experience of the individual student before we can determine present and future needs. Such an analysis has been made at the University of Michigan and the results are presented in this study.

The study is divided into three parts: first, a determination of actual physical education experience of students in supervised and non-supervised activities during the high school period; second, a determination of the interests of students in physical education activities at the time of entrance to the University; and third, a self-rating by the student of her skill in various physical education activities.

Information for each of the three parts of the study was obtained by means of the group interview and questionnaire method administered to groups of freshman women. A copy of the interview schedule is appended. Starred items were not included in the study.

A physical education instructor presented the material to groups of not more than 10 students at the time of their health examination. Each student was given an interview schedule to fill out under the instructor's supervision. To insure the fullest cooperation the students were made cognizant of the fact that the information given would enable the Department of Physical Education to plan with them the type of physical education program which would best meet their needs. This technique was used with freshman women entering the University during the years 1932–33 and 1933–34. Statistical reports are given in this study for only the year 1932–33, and include 347 freshman women.

* A paper presented before the Research Section at the American Physical Education Association Convention, April, 1934, at Cleveland, Ohio.

## PART I

### PHYSICAL EDUCATION EXPERIENCE OF UNIVERSITY OF MICHIGAN FRESHMAN WOMEN IN SUPERVISED AND NON-SUPERVISED ACTIVITIES DURING THEIR HIGH SCHOOL PERIOD

The type of physical education experience with which women enter the University is related to the nature and size of the high school from which they come. It was of interest, therefore, to determine the size of high school represented by students in this study. Two hundred eighty-two of the students answered the question relating to the size of the high school and the following distribution is shown. (See Table I.)

TABLE I

PERCENTAGE DISTRIBUTION OF FRESHMAN WOMEN AT THE UNIVERSITY OF MICHIGAN REPRESENTING CLASS A, B, C, AND D HIGH SCHOOLS*

| High School (Class) | Per Cent of Students |
|---|---|
| Class A (700 and up) | 68.1 |
| Class B (300 to 699) | 18.1 |
| Class C (100 to 299) | 9.9 |
| Class D (Less than 100) | 3.9 |

* Based on classification of University of Michigan Bureau of Accrediting High Schools.

It is of interest to note that over 86 per cent of the students came from Class and A and B high schools. This proportion would probably vary with every college and university in the country.

The physical education time requirement in the high school varies as to the number of years and times per week. Table II gives an analysis of these time requirements.

TABLE II

THE HIGH SCHOOL PHYSICAL EDUCATION TIME REQUIREMENT OF UNIVERSITY OF MICHIGAN FRESHMAN WOMEN IN HIGH SCHOOL

| No. Years Required | No. Hours Per Week Required | | | | | No. of Students |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| 4 | 1 | 56 | 24 | 17 | 19 | 117 |
| 3 | 1 | 22 | 14 | 2 | 8 | 47 |
| 2 | 1 | 46 | 18 | 6 | 24 | 95 |
| 1 | | 14 | 7 | 1 | 10 | 32 |
| 0 | No requirement | | | | | 23 |

Table II reads thus (reading from left to right on the first row): One student came from a high school having a physical education requirement of 1 period a week for 4 years; 56 students came from high schools having a physical education requirement of 2 periods a week for 4 years, etc. There were 117 or 34.4 per cent of the entering freshman women who came from high schools which had a 4-year requirement.

Considering a school year as 38 weeks, then from the above table the

average amount of physical education with which a woman student enters the University of Michigan can be estimated. For example, of the 117 students who had a 4-year physical education requirement in high school,

1 student met *once* a week for 38 weeks for 4 years or a total of 152 class hours
56 students met *twice* a week for 38 weeks for 4 years or a total of 17,024 class hours
24 students met *three* times a week for 38 weeks for 4 years or a total of 12,464 class hours
17 students met *four* times a week for 38 weeks for 4 years or a total of 10,336 class hours
19 students met *five* times a week for 38 weeks for 4 years or a total 14,440 class hours

The total amount of time spent in physical education by these 117 students, therefore, was 54,416 class hours. In like manner, the total amount of time spent by students where there was a 3-2-1 year requirement with a varying number of times per week, was 41,110 physical education hours. This gives a grand total of 95,526 physical education hours and represents the total physical education experience (in hours) of the 314 freshman women who replied to this question when they entered the University of Michigan in the fall of 1931. The average freshman woman, therefore, may be said to represent 304.22 hours of physical education experience in high school. This is equivalent to the time spent in physical education for 2 years nearly 4 times a week. Such a figure would indicate that the average student entering the University of Michigan at least should have been exposed to physical education.

Further investigation reveals that while some students did not fulfill the requirement as set up by their high schools, others exceeded it. This data appears in Tables III and IV.

TABLE III

NUMBER OF STUDENTS NOT COMPLETING THE PHYSICAL EDUCATION IN THEIR HIGH SCHOOLS*

| No. Years of Requirement | Years of Physical Education Actually Completed | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 |
| 4 | 2 | 1 | 11 | 9 | | |
| 3 | 2 | 5 | 6 | | | |
| 2 | 5 | 6 | | | | |
| 1 | 4 | | | | | |

* Figures in table represent cases.

According to Table III it is apparent that a total of fifty-one students failed to complete their physical education requirement. Reasons for this were not given. The number of students who took more physical education than was required is indicated in Table IV.

It is apparent from this table that a total of thirty-seven students took more work in physical education than was required. Comparing the data of Tables III and IV, the following items appear:

| | |
|---|---|
| 25 failed to fulfill requirement by 1 year. | 23 exceeded requirement by 1 year. |
| 21 failed to fulfill requirement by 2 years. | 9 exceeded requirement by 2 years. |
| 3 failed to fulfill requirement by 3 years. | 2 exceeded requirement by 3 years. |
| 2 failed to fulfill requirement by 4 years. | 3 exceeded requirement by 4 years. |

This comparison shows that the number of students who failed to fulfill the requirement is greater than the number who exceeded it. The amount of physical education which the average woman student entering the University of Michigan had in 1932, therefore, was probably

TABLE IV

NUMBER OF STUDENTS WHO EXCEEDED THE PHYSICAL EDUCATION REQUIREMENT IN THEIR HIGH SCHOOLS*

| No. Years of Requirement | Years of Requirement Actually Taken | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 |
| 4 | | | | | | 2 |
| 3 | | | | | 1 | |
| 2 | | | | 17 | 5 | |
| 1 | | | 2 | 4 | 2 | |
| 0 | | 1 | | | 3 | |

* Figures in table represent cases.

actually less than the amount she should have had. The amount of physical education that the average student should have had, as indicated in Table II, was approximately two years four times per week. But because there were fewer students who completed the requirement in high school than who exceeded it, the actual amount of physical education with which the average student really entered was probably a little more than two years three times per week. This is significant for program planning.

The importance of knowing the specific activities which were included in this playing experience in physical education was recognized in this study. To determine this content, however, was difficult since to investigate the programs of physical education from the various schools represented by entering students was impractical and, at this time, impossible. The student's statement of experience in specific physical education activities, therefore, was accepted as an indication of the general content of physical education programs in the various schools represented. The results of the analysis of supervised activities during the high school years are indicated in Table V.

The table shows, for example, that 123 students or 64 per cent of those coming from Class A high school have played baseball; 40 students or 78.4 per cent of those coming from Class B high schools have played baseball; and so on. This data clearly indicates the emphasis placed

TABLE V

ANALYSIS OF SUPERVISED PHYSICAL EDUCATION ACTIVITIES ENGAGED IN DURING HIGH SCHOOL YEARS. UNIVERSITY OF MICHIGAN FRESHMAN WOMEN 1932–1933

| Activities | *Class A High School* | | *Class B High School* | | *Class C High School* | | *Class D High School* | | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Students | % of Students | No. of Students | % of Students | No. of Students | % of Students | No. of Students | % of Students | No. of Students | % of Students |
| Baseball | 123 | 64. | 40 | 78.4 | 14 | 50. | 6 | 54.5 | 183 | 52.5 |
| Basketball | 146 | 76. | 44 | 86.2 | 21 | 75. | 7 | 63.6 | 218 | 62.6 |
| Fieldball | 18 | 9.3 | 9 | 17.6 | 2 | 7.1 | 1 | 9.0 | 30 | 8.9 |
| Field Hockey | 80 | 40.6 | 15 | 29.4 | 12 | 42.8 | 4 | 36.3 | 111 | 31.8 |
| Soccer | 40 | 20.8 | 23 | 45. | 8 | 28.5 | 2 | 18.1 | 73 | 20.9 |
| Volleyball | 97 | 50.5 | 31 | 60.7 | 18 | 64.2 | 6 | 54.5 | 152 | 43.6 |
| Archery | 18 | 9.3 | 7 | 13.7 | 3 | 10.7 | 2 | 18.1 | 30 | 8.9 |
| Bowling | 18 | 9.3 | 0 | 0 | 2 | 7.1 | 0 | 0 | 20 | 5.7 |
| Correctives | 17 | 8.8 | 7 | 13.7 | 5 | 17.8 | 3 | 27.2 | 32 | 9.1 |
| Fencing | 0 | 0 | 1 | 1.9 | 0 | 0 | 0 | 0 | 1 | .2 |
| Golf | 6 | 3.1 | 2 | 3.8 | 0 | 0 | 0 | 0 | 8 | 2.2 |
| Gymnastics | 89 | 46.3 | 22 | 43.1 | 9 | 32.1 | 5 | 45.4 | 125 | 35.9 |
| Riding | 8 | 4.1 | 1 | 1.9 | 2 | 7.1 | 1 | 9. | 12 | 3.4 |
| Swimming | 88 | 45.8 | 6 | 11.7 | 6 | 21.4 | 5 | 45.4 | 105 | 30.1 |
| Tennis | 58 | 30.2 | 15 | 29.4 | 7 | 25. | 6 | 54.5 | 86 | 24.7 |
| Folk Dancing | 57 | 29.6 | 18 | 35.2 | 4 | 14.2 | 2 | 18.1 | 81 | 23.2 |
| Rhythms | 24 | 12.5 | 16 | 31.3 | 7 | 25. | 2 | 18.1 | 49 | 14. |
| Tap Dancing | 70 | 36.4 | 16 | 31.3 | 6 | 21.4 | 1 | 9. | 97 | 27.8 |

on team games in high schools. Except for gymnastics and swimming (in Class A schools) practically no individual sports received emphasis.

Further analysis of playing experience indicates the number of different activities in which the students participated. (See Table VI.)

Again, marked differences appear as to the type of activities which receive emphasis in this group. Sixteen per cent had not participated in any team sport whereas 32.2 per cent had not participated in any individual sport and 49.7 per cent, almost 50 per cent of the group, had no experience in rhythmic activities.

TABLE VI

PERCENTAGE PARTICIPATION OF 344 WOMEN IN TEAM SPORTS, INDIVIDUAL SPORTS, AND RHYTHMIC ACTIVITIES DURING THEIR HIGH SCHOOL CAREERS. 344 UNIVERSITY OF MICHIGAN FRESHMAN WOMEN 1932–1933.

| No. of Different Activities | *Team Sports* | | *Individual Sports* | | *Rhythmic Activities* | |
|---|---|---|---|---|---|---|
| | No. of Students | % of Students | No. of Students | % of Students | No. of Students | % of Students |
| 0 | 57 | 16.5 | 111 | 32.3 | 171 | 49.7 |
| 1 | 38 | 11. | 96 | 27.9 | 112 | 32.5 |
| 2 | 80 | 23.2 | 64 | 18.5 | 41 | 11.9 |
| 3 | 59 | 17.1 | 45 | 13. | 20 | 5.8 |
| 4 | 72 | 21.2 | 22 | 6.4 | | |
| 5 | 28 | 8.1 | 5 | 1.4 | | |
| 6 | 10 | 2.9 | 1 | .2 | | |

At the University of Michigan it is assumed that a student, before completing her college course, should have an opportunity to experience a wide variety of physical education activities. This assumption is based on the generally accepted idea that a complete activity program should include team games, individual sports, rhythmics, correctives, and self-testing activities. Furthermore, it was assumed that to allow free choice of physical education activities on the college level, students should have had some playing experience in at least two group games, two individual sports, and some type of rhythmic activity. Of the total number of students entering as freshmen in 1932, 24 per cent had had experience in at least two group games, two individual games, and one rhythmic activity. Such findings again emphasize the need for careful study of student experience as a factor in developing a sound physical education curriculum.

A knowledge of playing experience as mentioned earlier must include not only activities which have been carried on in school, but a knowledge also of those activities in which the student participated outside of school supervision. These activities have been designated as non-supervised activities.

During the group interview mentioned above, each student was asked to check all of the activities in which she had participated outside of school supervision. It might be expected that in general the student would carry over into her outside play periods the same type of activity

she learned in her school work, provided the physical education program in high school was based on the needs of the students and the facilities which the environment afforded. This does not seem to be the case as Table VII shows.

TABLE VII

A Comparison of Supervised and Non-Supervised Physical Education Activities During the High School Age.
University of Michigan Freshman Women 1932–33

| No. of Different Activities | *Team Sports* | | *Individual Sports* | | *Rhythmic Activities* | |
|---|---|---|---|---|---|---|
| | Supervised | Non-supervised | Supervised | Non-supervised | Supervised | Non-supervised |
| 0 | 16.5% | 67.7% | 32.3% | 13.9% | 49.7% | 81.9% |
| 1 | 11. | 18.1 | 27.9 | 13.9 | 32.5 | 13.3 |
| 2 | 23.2 | 6.1 | 18.5 | 28.4 | 11.9 | 3.4 |
| 3 | 17.1 | 4.9 | 13. | 24.1 | 5.8 | 1.1 |
| 4 | 21.2 | 2.3 | 6.4 | 12.5 | | |
| 5 | 8. | .2 | 1.4 | 5.5 | | |
| 6 | 2.9 | .5 | .2 | .8 | | |
| 7 | | | | .2 | | |

Table VII clearly indicates that team games as "out-of-school" pastimes are not popular with girls of this age. Eighty-seven and six tenths per cent of the students participated in individual sports outside of school supervision, with 43.6 per cent participating in three or more individual sports. In comparison 29 per cent of the students participated in team sports. Whether this lack of carry-over of team sports can be attributed to the insufficient facilities in the community or to the old tradition that team sports are not the proper type of activity for high school girls or to the fact that girls have not worked cooperatively for a long enough period, or to the nature of the sport itself as appealing to this age level is questionable. On the other hand, the greater popularity of individual sports during out-of-school hours may be due to a natural interest in these activities and inadequate opportunity for practice in the high school. After-school programs more often sponsor team games. One wonders what the effect would be if the emphasis were placed on individual games.

A picture of the specific games played outside of school during high school years is presented in Table VIII. Especial attention is called to the figures for riding, swimming, and tennis.

## SUMMARY OF PART I

1. Of 282 freshman women entering the University of Michigan in the fall of 1932, 68.9 per cent attended Class A high schools while a total of 86.2 per cent attended either Class A or B high schools.

2. The average amount of physical education with which the average freshman woman entered the University was equivalent to two years, three times per week.

3. From an analysis of student playing experience, it is apparent

TABLE VIII

NUMBERS AND PERCENTAGES OF WOMEN STUDENTS PARTICIPATING IN SPORTS OUTSIDE OF SCHOOL SUPERVISION

| *Team Games* | | *Individual Sports* | |
|---|---|---|---|
| Baseball | 84 or 24.4% | Archery | 51 or 14.8% |
| Basketball | 51 or 14.8% | Bowling | 24 or 6.9% |
| Fieldball | 6 or 1.7% | Fencing | 7 or 2. % |
| Field Hockey | 18 or 5.2% | Golf | 102 or 29.6% |
| Soccer | 14 or 4. % | Gymnastics | 12 or 3.4% |
| Volleyball | 34 or 2.9% | Riding | 111 or 32.2% |
| *Rhythms* | | Swimming | 252 or 73.2% |
| Folk Dancing | 13 or 3.7% | Tennis | 225 or 65.4% |
| Rhythms | 30 or 8.7% | | |
| Tap Dancing | 40 or 11.6% | | |

that the major emphasis in physical education was placed on group games, with very little emphasis on individual and dual activities.

4. There appears to be very little carry-over from the activities taught in the high school physical education period to the out-of-school activities. Swimming, tennis, and riding are the most popular out-of-school activities. This may be due to inadequate school facilities for carrying on individual games or it may be due to some other factors.

## PART II

### DETERMINATION OF PHYSICAL EDUCATION INTERESTS OF WOMEN STUDENTS AT THE TIME OF THEIR ENTRANCE TO THE UNIVERSITY OF MICHIGAN

Student interest is widely recognized as an important factor to be considered in setting up any curriculum. The practical difficulty in the way of utilizing student interests to a greater extent is the absence of valid techniques for determining those interests.

Psychologically, the college age may be considered the period of late adolescence—the age often considered the period for the development of interests in individualized games. Adolescence, however, is also thought of as the period of interest in team games. On the other hand, Lehmann and Witty in their book, *The Psychology of Play Activities*, indicate that no age between eight and a half and twenty-two and a half inclusive could be designated as social or individualistic on the basis of the play behavior therein revealed. With these two varying views in mind it is of interest to note the play interests of the University freshman women in 1932. Table IX gives the activities ranked in order of interest.

The first five sports which were ranked in order of preference include both team and individual activities. However, individual sports predominate. A comparison of participation in supervised activities and non-supervised activities with the best liked activities during the high school age is given in Table X.

This table shows that in only one instance the high schools offered an activity (basketball) which is ranked by the freshman women as

one of the five best liked activities. This fact may have some bearing on the cause for dissension which is sometimes present among college students when more physical education is required of them. For the physical education instructor who may be planning further work for college students, it would seem necessary for her to be cognizant of the universal appeal of certain types of activities.

TABLE IX

ACTIVITIES RANKED IN ORDER OF INTEREST BY 344 FRESHMAN WOMEN AT THE UNIVERSITY OF MICHIGAN

| Rank Order | Activities | No. Indicating Interest |
|---|---|---|
| 1 | Swimming | 225 or 64.8% |
| 2 | Tennis | 189 or 54.9% |
| 3 | Basketball | 107 or 31.1% |
| 4 | Riding | 94 or 27.3% |
| 5 | Golf | 67 or 19.4% |
| 6½ | Tap Dancing | 54 or 15.7% |
| 6½ | Field Hockey | 54 or 15.7% |
| 8 | Baseball | 43 or 12.5% |
| 9 | Archery | 42 or 12.2% |
| 10 | Volleyball | 32 |
| 12 | Soccer | 20 or 5.8% |
| 12 | Rhythms | 20 or 5.8% |
| 12 | Folk Dancing | 20 or 5.8% |
| 14 | Bowling | 14 or 4.0% |
| 15½ | Fencing | 6 or 1.7% |
| 15½ | Gymnastics | 6 or 1.7% |
| 17 | Fieldball | 1 or .2% |

TABLE X

ACTIVITIES RANKED IN ORDER ACCORDING TO (1) BEST LIKED ACTIVITIES, (2) FREQUENCY OF PARTICIPATION IN SUPERVISED ACTIVITY, AND (3) FREQUENCY OF PARTICIPATION IN NON-SUPERVISED ACTIVITIES DURING THE HIGH SCHOOL AGE

| Activities | Best Liked Activity | Supervised Activities | Non-Supervised Activities |
|---|---|---|---|
| Swimming | 1 | 6 | 1 |
| Tennis | 2 | 8 | 2 |
| Basketball | 3 | 1 | 6½ |
| Riding | 4 | 15 | 3 |
| Golf | 5 | 16 | 4 |
| Tap Dancing | 6½ | 7 | 8 |
| Field Hockey | 6½ | 5 | 11 |
| Baseball | 8 | 2 | 5 |
| Archery | 9 | 12½ | 6½ |
| Volleyball | 10 | 3 | 15 |
| Soccer | 12 | 10 | 13 |
| Rhythms | 12 | 11 | 9 |
| Folk Dancing | 12 | 9 | 12 |
| Bowling | 14 | 14 | 10 |
| Fencing | 15½ | 17 | 16 |
| Gymnastics | 15½ | 4 | 14 |
| Fieldball | 17 | 12½ | 17 |

Table XI indicates the activities in which the entering freshman women desired further instruction.

TABLE XI

NUMBER AND PERCENTAGE OF 344 FRESHMAN WOMEN DESIRING FURTHER INSTRUCTION IN ACTIVITIES

| Activities | No. of Students | % of Students |
|---|---|---|
| Tennis | 196 | 56.9 |
| Swimming | 162 | 47. |
| Golf | 135 | 39.2 |
| Riding | 111 | 32.2 |
| Archery | 95 | 27.5 |
| Tap Dancing | 84 | 24.4 |
| Fencing | 75 | 21.8 |
| Field Hockey | 72 | 20.9 |
| Basketball | 72 | 20.9 |
| Rhythms | 48 | 13.6 |
| Bowling | 37 | 10.7 |
| Gymnastics | 22 | 6.3 |
| Folk Dancing | 17 | 4.9 |
| Baseball | 15 | 4.3 |
| Soccer | 11 | 3.1 |
| Volleyball | 8 | 2.3 |
| Fieldball | 1 | .2 |

Referring back to Table IX and comparing the order of activities of that table with the order of activities in Table XI, a difference is noted. One hundred and seven students listed basketball as a favorite activity, but only 72 felt that they wanted further instruction. Again, 225 students listed swimming as a favorite activity, but only 162 wanted further instruction. This would tend to indicate several facts which should be noted for curriculum planning—either some students have had good instruction in these activities, or they do not appreciate the need for further instruction. Such facts should aid in determining the types of activities to be offered and their emphasis in the required program and the extra-curricular program.

In some of the activities such as archery, golf, riding, etc., students desire instruction (compare IX and XI) who have not had an opportunity to participate in the activity. If opportunities are provided for participation in the activity, and if a continuation study were made after there had been participation in these activities by the student, then very probably the ranked order of the activities as listed in Table IX would be changed. Such a consideration again makes one aware of the need for careful attention to all possible phases of background in planning courses of instruction and for providing a well rounded program.

## SUMMARY OF PART II

1. Playing interests of this group are varied. However, swimming, tennis, basketball, golf, and riding are the five best liked activities.

2. High school physical education programs offer only infrequently the opportunity to become familiar with activities mentioned above with the exception of basketball. As a result, the scope of the college physical education program must become very broad.

## PART III

### SELF-RATING OF SKILL IN PHYSICAL EDUCATION ACTIVITIES

It is generally agreed that enjoyment of an activity depends upon skill in the activity. Upon analysis, this statement becomes less tangible, for skill is a variable quality which is difficult to judge accurately.

In this study, skill in activity has been considered as it is judged by the student herself. Definition of these terms was explained carefully to the students as follows. If they considered themselves above the average of the class or group in a specific activity, they were to rate themselves as "skilled" in the activity. If they considered themselves no better than the average in their group in an activity, they were to rate themselves as "average." If they did not play the activity as well as the majority of the groups, then they were to rate themselves as only fair in ability.

Such a judgment will, of course, vary greatly with individuals because of the difference in training, the difference in standards for good performance, and the difference in the abilities of individuals to make correct subjective judgments. Regardless of these facts, self-ratings are of value because only through them can we confirm or refute (for the individual) the statement regarding skill and enjoyment of activities. Knowledge of self-ratings in various activities also help to determine the emphasis which the development of skills should have in our physical education program. Table XII shows the results of these self-ratings in seventeen different activities.

Starred activities are those which were shown previously to be the five best liked. More students considered themselves skilled in swimming than in any other activity. This also was the activity which was liked best by the greatest number of students. Tennis, the sport ranking second highest in popularity, had only a very small group who rated themselves as skilled and a very large group—48.6 per cent (almost half) who considered themselves as below average in their ability to play. Even with basketball, the activity in which more students have received instruction than any other, 31.5 per cent considered themselves only fair in their ability to play the game as they felt it should be played. Practically the same facts may be noted in the two other "best liked" activities—golf and riding.

From such figures one may question the statement that we like best those activities in which we have skill. If we accept self-ratings of skill, it appears that there may be enjoyment without skill. Would it be more accurate to say that there will be longer participation in those sports in which a person is skilled, or do the inherent qualities of the game provide long-time enjoyment regardless of skill or is skill an entirely relative factor which can only be determined in terms of individual capacities and individual standards?

At the University of Michigan, we have considered a well-rounded physical education program to include satisfactory skill in one or more team sports, one or more individual activities, and one or more rhythmic

TABLE XII

NUMBERS AND PERCENTAGES OF FRESHMAN WOMEN RATING THEMSELVES IN THE VARIOUS SPORTS

| Activities | *Number of Students* | | | | *Percentages* | | |
|---|---|---|---|---|---|---|---|
| | Skilled | Average | Fair | Total | Skilled | Average | Fair |
| Baseball ..... | 19 | 91 | 86 | 196 | 9.6 | 45. | 43. |
| *Basketball ..... | 34 | 116 | 69 | 219 | 15.5 | 52.9 | 31.5 |
| Fieldball ..... | 2 | 14 | 17 | 33 | 6. | 42.4 | 51.5 |
| Hockey ..... | 24 | 45 | 46 | 115 | 20. | 39.2 | 40. |
| Soccer ..... | 5 | 37 | 29 | 71 | 7. | 32.1 | 40.8 |
| Volleyball ..... | 12 | 74 | 56 | 142 | 8.4 | 52.1 | 39.4 |
| Archery ..... | 4 | 29 | 34 | 67 | 5.9 | 43.2 | 50.7 |
| Bowling ..... | 1 | 16 | 21 | 38 | 2.6 | 42.1 | 55.2 |
| Fencing ..... | 1 | 4 | 1 | 6 | 16.6 | 16.6 | 16.6 |
| *Golf ..... | 6 | 28 | 51 | 85 | 7. | 32.9 | 60. |
| Gymnastics ..... | 11 | 61 | 23 | 95 | 11.5 | 64.2 | 24.2 |
| *Riding ..... | 25 | 47 | 28 | 100 | 25. | 47. | 28. |
| *Swimming ..... | 62 | 18 | 62 | 182 | 34. | 64.5 | 34. |
| *Tennis ..... | 16 | 16 | 106 | 218 | 7.3 | 44. | 48.6 |
| Folk Dancing ... | 11 | 33 | 16 | 60 | 18.3 | 55. | 26.6 |
| Rhythms ..... | 8 | 25 | 16 | 49 | 16.3 | 51. | 32.6 |
| Tap Dancing .... | 10 | 44 | 38 | 92 | 10.8 | 47.8 | 41. |

activities. Table XIII shows the number of students who rated themselves as having skill in some of these different activities at entrance to the University.

This table does not indicate the number of students who rated themselves as "skilled" in combinations of the different types of activities. A case study of results, however, showed that 41 or 21 per cent of the students who rated themselves as skilled in either team, individual, or rhythmic activities rated themselves as skilled in one of the other groups as well. Of the total of 190 students who rated themselves, there were 149 or 78 per cent of the students who considered themselves as skilled in at least 1 activity.

TABLE XIII

NUMBER AND PER CENT OF STUDENTS WHO RATED THEMSELVES AS SKILLED IN TEAM GAMES, INDIVIDUAL ACTIVITIES, AND RHYTHMICS
190 FRESHMAN WOMEN, UNIVERSITY OF MICHIGAN—FALL OF 1932

| Type of Activity | *One Activity* | | *Two Activities* | | *Three Activities* | | *Four Activities* | | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Team ..... | 41 | 11.4 | 21 | 5.8 | 4 | 1.1 | 1 | .2 | 67 | 18. |
| Individual .. | 68 | 19. | 20 | 5.6 | 4 | 1.1 | 1 | .2 | 93 | 26. |
| Rhythms .... | 13 | 3.6 | 15 | 4.2 | 2 | .4 | 0 | 0.0 | 30 | 8.4 |

Of course, it is difficult to judge the validity of these figures, since satisfactory objective tests are not available as a means of checking the self-ratings. An attempt was made, however, to secure some measure

of validity through the instructor's rating of a student. These ratings were given at the end of the various sport seasons. To be most valuable perhaps the ratings should have been given at the beginning of the season also. A comparison of instructors' and students' ratings, however, seems to at least indicate trends. The following table shows the results of this comparison.

TABLE XIV

PERCENTAGE COMPARISON OF STUDENT AND TEACHER RATINGS IN VARIOUS ACTIVITIES

| | *Hockey* | *Archery* | *Golf* | *Swimming* | *Tennis* | *Total* |
|---|---|---|---|---|---|---|
| *Over-rating by students* | *(14) | *(12) | *(20) | *(30) | *(133) | *(209) |
| Student's rating—skilled<br>Instructor's rating—fair | 21% | | | 6% | 2% | 4. % |
| Student's rating—skilled<br>Instructor's rating—average | 21% | 8% | 5% | 20% | 5% | 8.1% |
| Student's rating—average<br>Instructor's rating—fair | 7% | 50% | 15% | 26% | 26% | 25. % |
| *Agreement of student and instructor's rating* | 14% | 33% | 50% | 40% | 56% | 49. % |
| *Under-rating by students* | | | | | | |
| Instructor's rating—skilled<br>Student's rating—fair | 7% | | 5% | | 2% | 2. % |
| Instructor's rating—skilled<br>Student's rating—average | 21% | | 10% | 3% | 1% | 4. % |
| Instructor's rating—average<br>Student's rating—fair | 7% | 8% | 15% | 3% | 9% | 7.1% |

* Numbers in parentheses are the number judged.

From this study of self-rating, it would appear that the skill of the students in playing the things that they like best is not great, and although they enjoy playing the games even with the amount of skill they now have, there is a definite desire for the acquisition of further skill. (Part II.)

### SUMMARY OF PART III

1. More students consider themselves skilled in swimming than in any other activity.

2. Students tend to overestimate and underestimate their ability in sports. Regardless of the fact that many rate themselves as only fair in an activity they often like that game the least. This seems to be contrary to our common conception of the necessity for skill to have enjoyment in an activity.

## CONCLUSIONS

This 3-part study of 347 freshman women entering the University of Michigan in 1932 gives evidence that:

1. In constructing a well-rounded physical education program, many enlightening and valuable suggestions can rather quickly be brought forth by an analysis of the playing experiences of a girl through the use of the interview questionnaire as used here.

2. The high school physical education programs included in this study are not yet completely fulfilling the desires or needs of the girls. As a result the college curriculum must be broad and varied.

## QUESTIONNAIRE

UNIVERSITY OF MICHIGAN

DEPARTMENT OF PHYSICAL EDUCATION FOR WOMEN

*Interview Questionnaire*

I. History of High School Experience in Physical Education

Name of H.S. attended.....

(If more than one, indicate years spent at each.)

City..... State.....

Approximate enrollment of school at time you attended.....

Was P.E. required? Yes No Number of years 1-2-3-4. Number times per week 1-2-3-4-5. Was credit allowed? Yes No How many years of P.E. did you have in H.S.? 0-1-2-3-4. Which years? Fresh., Soph., Jr., Sr. *Was Hygiene required? Yes No *Number of years 1-2-3-4. *Number times per week 1-2-3-4-5.

II. Physical Education Experience and Interests

Fill in the outline given below:

In Column I check all activities which you have had in H.S. Use one check for each season spent in each activity (√ one season; √√ two seasons. A season is fifteen class periods.)

In Column II check all activities which you have played outside of school supervision.

In Column III indicate how well you play each activity, using (1) if you do it "very well"; (2) if you are "average"; (3) if you are "fair." Compare yourself with the girls whom you considered average players in your school.

In Column IV check activities which you like the best.

In Column V check activities which you would like to learn while in college, regardless of whether you think you would do them well.

| Activities | Column I | Column II | Column III | Column IV | Column V |
|---|---|---|---|---|---|
| Baseball | | | | | |
| Basketball | | | | | |
| Fieldball | | | | | |
| Field Hockey | | | | | |
| Soccer | | | | | |
| Volleyball | | | | | |
| Archery | | | | | |
| Bowling | | | | | |
| Correctives | | | | | |
| Fencing | | | | | |
| Golf | | | | | |
| Gymnastics | | | | | |
| Riding | | | | | |
| Swimming | | | | | |
| Tennis | | | | | |
| Folk Dancing | | | | | |
| Rhythms | | | | | |
| Tap Dancing | | | | | |

III. Other interests

*What things other than those listed do you enjoy doing in your spare time?

*What are your favorite school subjects?

*In what field are you planning to major?

IV. Plans for Physical Education courses.

* Starred items were not included in the study.

# A Comparison of Health Knowledge and Health Instruction at the Sixth Grade Level in Certain Rural and Urban Schools*

By Joseph H. Jones

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FOR MANY decades the disadvantages of rural schools have been recognized by educators. Numerous studies have been made showing the handicap under which the rural teachers work. Some of these investigations have made comparisons of existing conditions in town or city schools with those of the one-room country school and the resultant comparisons have always been to the disadvantage of the rural school.†[1]

There are some people who claim rural pupils do better work than children of the city schools even though they are handicapped. This opinion is exceptional rather than that commonly accepted. In a study made by McIntosh and Schrammel they found that scores made in reading, spelling, arithmetic, history, and civics were distributed in about the same way but that the measures of central tendency were higher for the city group. In arithmetic, reading, and spelling the city children were much more superior than the rural children. In English, civics, and history the superiority of the city children over the rural children was not so pronounced.[2]

In another study made by Frost comparing these two groups it was found that the quality of writing was the same but the rate was higher in the country. Rural spelling was uniformly below that of the city children. Rural children were two grades lower in arithmetic than urban children. In general it was found that rural education was inferior to that of the city.[3]

In a United States Bureau of Education Survey, comparisons showed that pupils in the rural schools made lower scores, grade for grade, than the city schools.[4]

The above literature indicates what might be anticipated in a future

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† Numbers refer to bibliography at end of article.

study comparing rural and urban groups in what has been termed the essentials of our educational program.

There are very few comparative studies in the field of health education. This is partly due to the attitude towards health as part of our educational scheme. The new interest which has prompted a few comparative health studies is attributed to the changing attitude of educators in matters of health. Andress says, "reading, writing, and arithmetic have always been considered as the essentials in every educational program, but these are really of secondary importance. Of what use are these tools if one is incapacitated through ill-health from using them?"[5]

Haisley in a recent address before a convention of the National Education Association sounds the keynote of this new attitude towards health education when he says, "Health has become an increasingly primary consideration of society. The school, to which society has delegated in part one of its most important tasks, must therefore pay increasing attention to the inculcation of health habits, health knowledge, and health attitudes in those whom *it* was established to guide."[6]

When attempting to make a comparison in the field of health education it is commonly assumed that the difference is favorable to the rural group. This is probably due to the belief that the environment of the country is more conductive to good health than that of the city.

Contrary to the above Andress states that, "the general backwardness of the rural districts in matters pertaining to health also extends to instruction and training in hygiene in rural schools. The teaching of hygiene in city schools has been far from praiseworthy but the probability is that it is far more practical than it is in rural schools."[7]

## STATEMENT OF THE PROBLEM

It is not believed that rural children are less capable than city children nor is it held that the rural population is less interested in the welfare of its children than the city dwellers. This study does not aim at discovering causes or suggesting means of removing unfavorable conditions. It is intended to discover only whether there is an excelling or sameness in the groups.

Since there are few existing studies in which rural and urban schools are compared as to health knowledge and instruction, a study attempted, even in a limited way, would have its merits.

It would seem that a comparison made with the aid of carefully constructed measuring devices would be more trustworthy than deductions made in reference to health from studies of subjects entirely different in content and instructional nature.

The purpose of this study is to devise a health knowledge test and a questionnaire. By the aid of these the health knowledge and health instruction in certain rural and urban schools of the sixth grade level are brought to a common basis for comparison.

## HEALTH KNOWLEDGE

"Health is dependent upon many factors besides knowledge. Among these are attitudes and habits. At the same time knowledge of facts in regard to health is no doubt of considerable importance in promoting the right attitudes and habits. There is, however, no complete agreement on the importance of knowledge in health education. Perhaps it is safe to say that health knowledge is at least one of the factors in health which the teacher will wish to take account of in attempting diagnostic measurement in health education."[8]

Though there is a tendency to discount the importance of health knowledge, it must be admitted that "there are certain fundamental knowledge tests which every pupil graduating from our public schools ought to pass without difficulty. To my mind such knowledge is as important as a proper command of the mother tongue."[9]

## CONSTRUCTING THE TEST

In forming the basis of the test used in this study the sixth grade basic texts and supplementary texts used in a number of schools were examined for health topics. There was a close similarity of the topics treated. The basic texts of the schools tested were examined with the same object in view. Those used in the schools tested were used. Two well-known tests were studied as to the number and range of topics treated. The tests were Scales for Measuring Habit Practices in Health and Accident Prevention by E. George Payne and the Gates-Strang Health Knowledge Test.

After considering the various topics emphasized in the textbooks, courses of study, and tests mentioned previously, it was decided to use those compiled during the construction of the Gates-Strang Health Knowledge Test because of the close agreement. This test was so devised that it may be used in any grade but since the testing was confined to the sixth grade, a few changes were made in the ranking of items of the test constructed by the writer. The ratio of the number of items of the Gates-Strang Test was closely followed by the writer in the assignment of the questions in the test constructed.

In a report of the Joint Committee on Health Problems this statement is made: "Except for the testing just described by Franzen and other tests of health knowledge by Gates-Strang, very little has been done in the actual assembling of health tests."[10] From the above it would seem that there is an opportunity for the teacher to devise and use tests, especially those with varied types of questions. Turner encourages this when he says, "The teacher will frequently test the health knowledge of the class by preparing and administering the usual type question-and-answer test, a one-word test, or other objective tests of the completion or true-false type."[11] In the test used by the writer there are forty-two multiple choice questions, thirty-two true-false questions, and twenty-three completion questions.

## SAMPLE QUESTIONS OF THE HEALTH KNOWELDGE TEST

### *Multiple Choice Questions*

We need foods containing lime because they build:
....bones
....skin
....muscle
....hair
....nerves

When dusting we should use:
....a dry cloth
....a damp or oiled cloth
....a small brush
....a feather duster
....an old piece of silk

When sick, people should:
....read about their sickness and buy patent medicines
....take medicine given by friends
....take drugs to relieve them
....go to a reliable doctor
....not do anything about it

All fruits and vegetables should be washed before using because:
....they look better
....they are more easily digested
....they have bacteria on them
....water adds food to them
....they seem fresher

### *True-False Questions*

....It is only necessary to go to a dentist when a person has the toothache.
....Colds are spread by coughing and spitting.
....People should not use drugs for every little pain.
....If water is clear and cold it is pure.

### *Completion Questions*

When germs enter a wound the wound is said to be .....
The part of the air most needed by the body is .....
..... prevents smallpox.
Utensils taken from the sick room should be .....

## ADMINISTERING THE TEST

The test was tried by giving it to a group of seventh grade pupils. None of the questions were missed by every one of the group nor were there any perfect scores made. The test was then given to pupils of the sixth grade. The results in this study came from 205 pupils and 5 teachers in a representative urban school of Western Pennsylvania and 207 pupils and 11 teachers in a representative rural township of Central Pennsylvania. The tests were twice scored. One point was given for each of the 97 items of the test. The scores made by each pupil on the odd and even numbered questions of the test were also determined.

## EVALUATION OF THE TEST

The criteria selected for evaluating this test were: validity, reliability, objectivity, comprehensiveness, facility, utility, and rapport.[12]

The test followed the "Gates-Strang Health Knowledge Test" in the ratio of items treated and in the construction of the multiple choice questions.

The reliability of this test was computed by correlating the scores on the odd and even numbered test items and then employing the Spearman formula.[13] The correlation for the rural group was .77 and .75 for the urban group.

## TABLE OF STATISTICS

The following table indicates the number of cases, the number of items, the standard deviation, the coefficient of correlation, the probable error of the coefficient, and the probable error of measurement.

TABLE I

| Group | No. Cases | No. Items | Mean | *S. D.* | *r* | *P. E.* *r* | *P. E.* *M* |
|---|---|---|---|---|---|---|---|
| Rural ..... | 207 | 97 | 67.5 | 10.5 | .77 | .010 | 3.39 |
| Urban ..... | 205 | 97 | 69.2 | 9.2 | .75 | .011 | 3.10 |

Since the main purpose of the test was health knowledge, every effort was made to keep the tests objective. In the completion section of the test, care was exercised in the wording so as to admit one response but equivalent phrases could not be avoided without sacrificing adherence to the general plan of the items. Such phrases were accepted.

The test constructed and used in this study is capable of portraying pupil achievement in health knowledge.

By following the wide range of items of the Gates-Strang test the test constructed was made as comprehensive as possible. A larger sampling would no doubt bear out the degree of comprehensiveness of the test. All tests were mimeographed with uniform directions to the pupils. The writer aimed at compactness in arrangement of items without producing confusion. The tests were easily scored with the accompanying score keys. Teachers and pupils reported a keen interest in the test.

## FINDINGS

The urban group of this study has a slight advantage over the rural group. In the multiple choice part of the test the rural group exceeded the urban group by 2 per cent. In the true-false part the difference was 2.2 per cent in favor of the urban group. In the completion percentages the urban group exceeded the rural group by 7.1 per cent. The total average of the urban group was 3.5 per cent more than that of the rural group.

A study was made of the nature of questions to determine any differences or similarities. The ten most frequently missed items and the ten most frequently correct items were determined. These were ranked according to frequency. There was quite a similarity in the content of the questions of each group. There were six items common to the first group and five common to the second group. The six items missed most frequently in each group were "best time to kill flies," "cold contagion," "amount of food for a sixth grade boy," "what adenoids are," "temperature of body," "what pasteurization is." The five items missed least frequently in each group were "proper habits of eating," "proper bed clothing," "importance of loose clothing," "care in crossing highways," "importance of sunshine."

## HEALTH INSTRUCTION

Turner defines health instruction as follows: "Health instruction may be defined as a systematic program for developing the habits, attitudes, and knowledge that will contribute to the physical, mental, and emotional health."[14]

The task of measuring the status of health instruction of a school population is not an easy matter and it is even more difficult to do this with the object of comparison in standards as this requires some definite measuring device. The scope of a health program discourages any attempts at measuring its various angles. A cross section, however, may be secured by formulating a questionnaire incorporating the certain points of health education that are basic to a health teaching program.

E. C. Davis made a study in methods and techniques used in surveying health and physical education in city schools. He analyzed 207 surveys of cities throughout the United States.[15] The questionnaire that seemed to be superior to others was that used in the Fort Worth survey. That used by the writer was constructed in a similar manner to the Fort Worth questionnaire.

## CONSTRUCTION OF THE QUESTIONNAIRE

The questionnaire constructed by the writer had three distinct parts:

1. General information of administering a course in health education.

2. Check list of activities used by the teacher in motivating health instruction.

3. Inventory of habits practiced by pupils.

The first part of the questionnaire included school population, teacher preparation, class instruction, textbooks and outlines, and habits taught. A list of twenty-five activities made up the second part. The teacher checked those that she used in the teaching of sixth grade health. The third part was an inventory sheet of health habits. The teacher wrote down the number of her sixth grade that practiced certain health habits. This was determined by the observation of the teacher or by questioning the pupil.

The questionnaire was answered anonymously. Returns were made by the five teachers of the urban pupils tested and by the eleven teachers of the rural pupils tested.

## COMPARATIVE ANALYSIS OF THE RETURNED QUESTIONNAIRES

The average number of years of teaching experience for the urban group was higher than that of the rural group. The rural teachers lacking experience in the teaching of health gave a more definite and richer list of college courses in health. These courses were more in keeping with the great aims of health education as we recognize them today.

Practically the same percentage of teachers in each group did not

use any outline. The outline of the state department was mentioned most frequently.

The average time given to health was only eight minutes more per week for the urban group. The weekly average for both groups was eighty-four minutes.

The percentage of teachers in the urban schools using correlation exceeded the percentage of rural teachers. For urban teachers it was 60 per cent and 55 per cent for the rural teachers.

The range of subjects correlated with health was similar in the two groups.

There is a close agreement in the name of the course. *Health education* is most common for the urban schools, *health,* for the rural.

Sixty per cent of the urban teachers and 55 per cent of the rural teachers followed each lesson of the textbook successively.

All teachers reported that there was supervision in health instruction.

All teachers in both groups expressed a favorable attitude toward the importance of health in the school curriculum.

The supplementary materials used by either group of teachers were limited. One urban teacher and two rural teachers reported that no supplementary materials were available. One teacher of the urban group and two of the rural teachers gave desirable lists of supplementary aids.

Posture and cleanliness were the two habits most often mentioned by teachers of both groups as being emphasized in the sixth grade.

The first nine activities on the list were used by a greater number of teachers of both groups. They were:

1. Weighing and measuring.
2. Listing and discussing of health rules.
3. Discussions of various subjects of health.
4. Comparison of body to a machine.
5. Contributing of clippings and pictures.
6. A health bulletin board.
7. Inspections.
8. Drawing pictures and making posters.
9. Listing foods and forming menus.

The rural teachers used more activities than the urban teachers. The percentage of activities used by the urban group was 35.2 per cent and that of the rural group was 43.2 per cent.

In the report on health practices it was found that the percentage for the urban group was 65.3 per cent and 57.1 per cent for the rural group. A comparison of the percentages of each group practicing each item revealed interesting facts. "Coming to school with clean hands, face, and clothing" has a high percentage which is practically the same for each group, while "eating candy only after meals" had a very low percentage in each group. The item, "dress so vigorous play is unhampered," had the greatest difference in percentages. The difference was in favor of the urban group.

## CONCLUSIONS

The results of this study show but a very slight difference in achievement—this unfavorable to the rural schools. The reliability of this difference is not significant.

Upon examining the test items of greatest and least frequency missed it was found that, in general, they were quite similar for the two groups.

The technic used in the construction of the Gates-Strang Health Knowledge Test was followed very closely in the forming of the varied type objective test of the study. This is recommended as a valuable guide for further construction and refining of health knowledge tests.

The questionnaire revealed a slight advantage of the urban schools over the rural schools in health instruction. This difference in this study is not as pronounced as the predictions and findings of most other comparative studies in these two groups.

More accurate findings would have been brought out if there had been homogeneous groups compared.

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# The Influence of Chronological Age on Motor Performance

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WHENEVER scientifically conducted studies have been made on the relative influence of chronological age, height, and weight on motor performance, age has always been found to be an important factor. It has, however, usually been assumed that the age relationship to performance was linear, at least up through the college ages. No published study has come to my attention that has investigated this phenomenon to see what the real relationship might be. This paper will report the results of several such studies conducted by the author.

These studies may be divided into two groups. One group has to do with strength tests and the other with track and field athletics. Since the strength-test study affords the simpler approach to the problem it will be presented first.

## STRENGTH TESTS

The data from which these studies on strength have been made are records of the Rogers' Physical Capacity Test made by the pupils of the public schools of Schenectady, New York, and supplied through the kindness of the supervisor of physical education for Schenectady, Mr. E. T. Graut.

There were records for 2,300 boys and 1,800 girls. In the material presented, chinning and dipping were scored according to the author's formula.[1] All strength events were equally weighted and lung capacity was omitted. The preliminary study of these data (which study will be presented elsewhere) gave proof that height could safely be neglected as a factor for predicting strength. Both age and weight were highly correlated with the strength index.

## THE METHOD OF STUDY

To determine the relative effect of age at each level, the records were sorted by age groups and a correlation was computed between weight and strength. The regression equation for predicting strength from weight was then derived. From these equations the predicted strength value was computed for the age following and the age before. For example, if the regression equation for the *twelve-year-old group* is

[1] C. H. McCloy, "A New Method of Scoring Chinning and Dipping." RESEARCH QUARTERLY, II: 4 (December, 1931).

under consideration, this equation was used to compute the predicted strength for the *eleven-year-old group* from the average weight for the eleven-year-olds, and was also used to compute the predicted strength for the thirteen-year-olds from the mean weight of the thirteen-year-old group. If the age factor itself has an effect over and above that involved in weight, the obtained value for the strength of the eleven-year-old group as computed from the twelve-year-old formula should be *greater* than the actual average value; while the value computed by the twelve-year-old formula from the thirteen-year-old mean should be *less* than the actual thirteen-year-old average. The average difference of strength as computed by the formulae from the age below and from the age above was adopted. To illustrate again, the difference between the twelve-year-old actual strength and the strength as computed by the eleven-year-old formula was averaged with the difference between the eleven-year-old average and the obtained strength by computing the strength for the eleven-year-old average weight with the twelve-year-old formula. These obtained averages were then plotted and smoothed; the results for the strength tests for both boys and girls are seen in Table I.

TABLE I

AVERAGE ANNUAL INCREMENT OF STRENGTH DUE TO CHRONOLOGICAL AGE ALONE. (ROGERS' TEST, WITHOUT LUNG CAPACITY, AND WITH PULL-UPS AND PUSH-UPS SCORED BY THE AUTHOR'S FORMULAE.) RECORDS ARE IN POUNDS.

| *Ages* | *Boys* | | *Girls* | |
|---|---|---|---|---|
| | *Raw Values* | *Smoothed Values* | *Raw Values* | *Smoothed Values* |
| 11–12 | 20 | 20 | 15 | 15 |
| 12–13 | 29 | 30 | 34 | 34 |
| 13–14 | 52 | 55 | 109 | 109 |
| 14–15 | 98 | 100 | 77 | 77 |
| 15–16 | 108 | 105 | —3 | 0 |
| 16–17 | 39 | 70 | —10 | 0 |
| 17–18 | 59 | 50 | —7 | 0 |
| 18–19 | —16 | 0 | | |

It will be noted that in the boys' strength test there is a rapid increase in the amount of added strength for each year from thirteen to sixteen years of age and a sharp decline after seventeen. After eighteen there is no further increase. This period corresponds to the period of active pubescent changes in the male.

In the girls' records, this rapid increase comes from twelve to fourteen years of age and corresponds to the earlier onset of puberty in the female; it declines abruptly at fifteen. The raw-score negative values obtained after fifteen are probably insignificant sampling errors, though there is a possibility that this decrease is due to an increasing disinclina-

tion to engage in physical activities. In other words, boys stop getting stronger so far as the age contribution is concerned at about eighteen, while girls stop adding to their strength at fifteen. The curve of addition to strength is not linear but increases at the period corresponding to most rapid adolescent growth and decreases rather sharply thereafter. It should be noted that this increase and decrease is in the *age increment* of strength, not in the strength itself.

## TRACK AND FIELD ATHLETICS

The data from which the studies on track and field athletics were made were as follows: (1) 1,000 elementary school boys from the Detroit, Michigan, public schools; (2) 1,300 public school girls from the elementary schools of Detroit (data obtained through the courtesy of Mr. V. S. Blanchard, Supervisor of Health Education); (3) 320 cases from the Gorton High School, Yonkers, N. Y. (data secured from Mr. H. L. McCurdy); (4) 130 cases from Oberlin College (data secured from Mr. Dan Kinsey); (5) 319 Chinese girls, ages ranging from 8 to 23, from the public schools of Nanking, China.

## METHOD OF STUDY

In the boys' elementary school data it was found that, as in the case of the strength test, height could be neglected, hence the method of study is the same in every particular as that described above in the study of strength. In the study of high school boys, height was used as the dependent variable, because of the fact that it correlated higher with performance. In the study of girls, both height and weight were taken into consideration. The girls' records were divided into age groups, and a multiple regression equation was computed for each age for predicting performances (scored in points) from height and weight. The same procedure was then used as that given in the strength study except that values for the ages on either side of the one studied were computed from the multiple regression equations, using the appropriate averages of height and weight. To illustrate, the value for the eleven-year-old track and field points was computed from the eleven-year-old averages of height and weight by the twelve-year-old formula, and the twelve-year-old averages of height and weight were used with the eleven-year-old formula, and the average differences were again used to represent the difference made by age.

These results are somewhat more conflicting than are those of strength. The results of the studies on the boys and girls of the elementary schools are given in Table II.

When to these elementary school results are added the smoothed values from the high school group, it will be seen that approximately the same phenomena are observed as in the strength test. Namely, there is

an increase in the average point value around the ages of puberty, which later decreases and in the case of the boys ceases at seventeen. The Oberlin data mentioned above show no age differences whatsoever from seventeen on.

In the girls' data the maximum increase is at the period from twelve to thirteen, one year earlier than was the case with strength. Again this increase ceases at fifteen. In the Chinese data a somewhat different method of analysis was used but there was a definite increase up to

TABLE II

AVERAGE ANNUAL IMPROVEMENT IN POINTS IN TRACK AND FIELD ATHLETICS (BOYS, FOUR EVENTS; GIRLS, THREE EVENTS, SCORED BY THE AUTHOR'S SCORING TABLES[2]) DUE TO CHRONOLOGICAL AGE ALONE

| | *Boys* | | | | *Girls* | |
|---|---|---|---|---|---|---|
| | *Elementary*[a] | | *High School*[b] | | *Elementary*[c] | |
| *Ages* | *Raw Values* | *Smoothed Values* | *Raw Values* | *Smoothed Values* | *Raw Values* | *Smoothed Values* |
| 10–11 | 34 | 34 | | | 50 | 50 |
| 11–12 | 41 | 41 | | | 56 | 56 |
| 12–13 | 44 | 53 | | | 59 | 59 |
| 13–14 | 65 | 65 | 71 | 73 | —23 | 33 |
| 14–15 | 67 | 67 | 94 | 77 | 63 | 7 |
| 15–16 | — | — | 19 | 71 | 0 | 0 |
| 16–17 | — | — | 159 | 64 | — | — |
| 17–18 | — | — | 4 | 38 | — | — |
| 18–19 | — | — | 0 | 0 | — | — |

[a] Computed from weight.
[b] Computed from height.
[c] Computed from both height and weight.

the age of fifteen. Beyond this there was no further increase. This corresponds exactly to the facts found in the American data.

The facts presented above would lead us to think that there is a high probability not only that the relationship between age and athletic or other motor performances is not a linear one, but that the relationships between height and performance, and weight and performance, are also non-linear. The author has elsewhere presented some evidence to this effect.[3] We believe that the implications of these facts should lead us to entirely restudy the whole problem of relationships of age, height, and weight with sufficiently large numbers to minimize sampling errors. The probabilities are that such studies would result in much more useful formulae than those which we have at present.

[2] C. H. McCloy, *Measurement of Athletic Power*, New York: A. S. Barnes and Company, 1932.
[3] C. H. McCloy, *loc. cit.*, Chapter V.

# Present Status of Health Education in Some Representative School Systems

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IT MAY be well at the start to crystallize the purpose of health education and describe how the aims tend to better present conditions by quoting Williams and Brownell. They tell us that the "purpose of health education is to secure wholesome environmental conditions and processes for school children, to protect them by scientific methods against communicable diseases and the hazards of growth and development, and to instruct them in scientific ways of living in which habits, skills, attitudes, and knowledge will have significant relationships."

With this statement in mind, a study was made to determine just how health education was organized in the school systems throughout the country. A general investigation substantiated a very definite impression that there is very little literature concerning the organization and supervision of the health education program. A survey, therefore, was made directly of certain aspects of health education as it is carried on in representative school systems, and it was hoped that this survey would show the status of health education particularly with reference to its organization, administration, personnel, policies, and procedures.

A questionnaire was composed and, that it might be adequate, submitted to a director of health education, a director of educational research, a headmaster, an assistant superintendent, and a teacher of health education for their approval. Their suggestions were incorporated and the following form was adopted.

To the Superintendent of Public Schools:

The writer is very much interested in health education. He asks your cooperation in giving him the following information in regard to your school system by checking the items listed.

Name of City ..... State.....
Name of Person Replying.....
Position of Person Replying.....

| | (Check) Yes | No |
|---|---|---|
| 1. Have you a course of study in health instruction?..... | ..... | ..... |
| 2. Have you a director or supervisor of health education?..... | ..... | ..... |
| 3. Is there a special certificate for teachers of health instruction? ..... | ..... | ..... |
| 4. Is safety instruction given as part of health instruction?.... | ..... | ..... |
| 5. Is mental health included in health instruction?..... | ..... | ..... |
| 6. Is the school lunch an integral part of the school health program? ..... | ..... | ..... |

7. Does the school cafeteria come under the Board of Education? ..... ..... .....
8. Frequency of weighing children as an educational procedure:
   Monthly ..... ..... ..... .....
   Twice a year..... ..... ..... .....
   Three times a year ..... ..... .....
9. Are notifications of weight of children sent to parents?..... ..... ..... .....
10. Are any of the following activities carried on by children for the purpose of increasing their health knowledge or habit formation?
    Making health books..... ..... ..... .....
    Making health posters..... ..... ..... .....
    Keeping notebooks ..... ..... ..... .....
    Supervising ventilation..... ..... ..... .....
    Height and weight records kept and posted in classroom..... ..... ..... .....
    Health clubs ..... ..... ..... .....
    Animal experimentation in classroom ..... ..... .....
11. Is it routine practice for all classroom teachers to have daily inspection of all children?..... ..... ..... .....
12. Are textbooks used in health instruction?..... ..... ..... .....
13. Do you permit commercial health material to be used in the classroom?
    Teachers' use..... ..... ..... .....
    Pupils' use ..... ..... ..... .....
14. Do you have separate course of study in health instruction for special schools?
    Part time..... ..... ..... .....
    Trade or Industrial ..... ..... .....
15. Number of minutes per week devoted to definite health instruction:

Grade I.....Grade V.....Grade IX.....
Grade II.....Grade VI.....Grade X.....
Grade III.....Grade VII.....Grade XI.....
Grade IV.....Grade VIII.....Grade XII.....

16. How do you measure results?
    Knowledge .....
    .....
    Habits .....
    .....

Remarks: .....
.....

Any additional information that you may be able to give regarding health education such as monographs, bulletins, reports, types of visual material and courses of study will be greatly appreciated and any suggestions growing out of your experience will be welcomed.

In requesting this information the writer realizes the encroachment on your time and courtesy, and if at any time he can be of service to you, he shall be very glad of the opportunity.

This form was sent to thirty representative school systems, scattered through the country, with a conscious consideration of large and small city school systems and of reputed progress in education. Despite the fact that this questionnaire required detailed information from the re-

cipients, it was favorably received and 67 per cent of those approached gave information which was complete enough to be of value. Since the average school superintendent has been literally bombarded with blanks, forms, and questionnaires in the last fifteen years, it was felt that this generous response indicated a definite, nation-wide interest, if not enthusiasm, concerning this newer movement of health education.

In order to consider the relative geographical replies of the questionnaire the country was divided into four sections. Twenty per cent of the replies were from school systems in the South; 20 per cent were from the West; 30 per cent were from the Northeastern and 30 per cent from the North Central sections. These replies furnished an excellent cross section of American school systems.

In order to classify what was learned from the questionnaire, the data compiled from the replies is grouped in the following order: organization, administration, personnel, policies, and procedures. Under organization fall questions 1–4–5–6–14–15; under administration are included questions 2–7–16; under personnel is found question 3; under policies are grouped questions 9–11–12–13; and under procedures are treated questions 8 and 10.

## ORGANIZATION PROBLEMS

The organization problems of health education varied, but there were strong indications that these problems were recognized and attempts were made to meet them.

*Course of Study.*—In answer to the question, "Have you a course of study?" all but four cities replied in the affirmative. Of the variables, one replied "No." Another city answered "loose sheets." The third said that its course of study was in the "process of construction." The fourth replied that the "supervisor outlined from month to month health projects to be carried on by the teachers." These comments show the tentative nature of some health courses of study, suggesting that this phase needs more consideration in some sections. Yet the fact that 80 per cent of the cities have courses of study indicates the growing recognition of the place of health in the curriculum. From the data submitted by these cities and from a further study of appraisals of courses of study it would appear that the elementary courses for grades one to six are well advanced; that courses for the junior high school (grades seven to nine) are in the developing stage; and that very little has been done in the senior high school field.

If the final test of learning is the emergence of appropriate conduct, then the teachers of upper as well as lower grades should have some outline of the general attitudes, the finer appreciations, the important concepts and meanings, which they wish to secure as part of the results of the program.

Not until such time as there is a course of study scientifically con-

structed for all grades can we expect a unified, graded, and progressive plan of instruction and training in health. School administrators must face the fact that if they give guidance to teachers in all phases of the curriculum except health, it will undoubtedly occupy a correspondingly minor position in the minds of the teaching force. Teachers are entitled to as much guidance in health teaching as in the teaching of other subjects. If health instruction and training are among the objectives of education, then the course of study is an important vehicle.

*Safety Education.*—From a study of the replies there appeared an equally growing recognition of the importance of safety. Although 20 per cent of the cities answered "No," 75 per cent of the cities declared that safety was included under health instruction. One far western city replied that safety was given a place in the curriculum, with definite time allotment and special supervision. This advance step, although it may appear to be desirable, does not appear to be essential. In view of the fact that safety is a health conservation problem and health is already recognized in the curriculum, it does seem like a duplication of work to separate safety from health in general.

*Mental Health.*—Eighty per cent of the cities favored including mental health under health instruction. One progressive system advocated a rather ambitious program in mental hygiene. But as used in this discussion, mental health is differentiated from mental hygiene. Mental hygiene, in its broad sense, refers to the negative as well as to the positive aspect, to the prevention and correction of mental disease. The common treatment of mental hygiene from a study of some twenty outstanding works in the field centers around insanity, functional nervous disorders, neurasthenia, psychasthenia, dementia praecox, chorea, tics, juvenile delinquency, emotional instability, etc. It is evident that this negative side does not fit into a positive health program. Furthermore, these phases call for clinical treatment, expert diagnosis, and a specialized staff. Then, too, this phase affects but a minority of the school population. We are mainly concerned with the great body of average pupils and their normal mental development.

Mental health refers to a reasonable amount of instruction under health instruction on certain relations of mental health to physical; for example, the frame of mind at meal time, the power of and need for relaxation, training of the will, and self-control.

*The School Cafeteria.*—The utilization and place of the school lunch in the health education program received earnest attention in 65 per cent of the cities. There is no doubt that the recent trend in educational organization for centralized, one-session schools is one of the outstanding causes of the lunch problem. The school cafeteria is a new and effective health agency in the school. School cafeterias should not be viewed as "feeding centers" but as educational centers. The health education supervisor should recognize and plan a program enabling the

child to carry over into the lunchroom the attitude and habit of practicing in food selection that which has been taught in health instruction. It was heartening to see those cities with the lunch problem doing something in a practical and constructive manner.

*Special Courses of Study.*—Separate courses of study for special schools received scant attention. Only two cities had given this phase serious consideration. How necessary separate courses are, is debatable. It is true that a continuation school would not want the lengthy course of a full-time school. But here it is not so much a problem of change of content as the problem of change of method. As a rule, the general course of study may be used for all schools with the versatile teacher adapting it to suit her particular needs. One may argue that the lack of a separate course of study for special schools leads to laxity of health teaching. Experience has not shown this to be true. Those familiar with administration and teaching in these schools know that the health problem is paramount and the interest of the faculty precedes any formal course of instruction.

*Time Allotment.*—The problem of time allotment showed the widest diversity. Two cities had integrated courses for all grades and four cities had definite time allotment for grades one to twelve. One city had a twenty-five minute period per week alloted for all grades from one to twelve. Two cities had definite time allotment for the first six grades, three cities for grades one to seven, one city for grades one to eight, twelve cities had definite time allotment over and beyond grade nine in addition to the time allotment for grades below that. One southern city had a worth-while plan of integrated work in the first five grades with a definite time allotment from grades six to twelve. The average time allotment was sixty minutes per week for every grade from one to twelve. This is an interesting highlight in view of the cry often heard that no more time can be given for new work. It shows definitely that school administrators are giving this new movement careful consideration and feeling it worthy of further time allotment in the senior high school.

## PROBLEMS OF ADMINISTRATION

Health education administration received great impetus when it was recognized in the field of educational administration.

*Directors of Health Education.*—Seventy-five per cent of the cities had directors of health education. This would lead to the deduction that health education is being recognized in the field of educational administration. In two of these cities the title embraced director of health and physical education. This two-fold title is found in the smaller city school system due to the limited appropriation and the smaller personnel. In one city the title read director of health and safety education. This dual title would connote the importance of safety as a health problem. In addition to the data from cities, the following facts from state

departments of education are interesting and worthy of mention here. In 1918, there were only eleven states with laws providing for a department of health and physical education in the state department of education and only four states with state directors of such departments. In 1930, thirty-six states, representing 90 per cent of the population of the country, had such laws in effect; thirty-one states, representing 80 per cent of the population, now have laws and state courses of study; and twenty states, representing 65 per cent of the population, have laws, courses of study and directors of health education.

*Measuring Results.*—Measuring results received the least attention and yet it is one of the most vital problems. The evident lack of some objective technique of measurement is a forceful reason for stressing the need of research in this field. Health education programs will progress only in proportion to the effective measurement and evaluation of results.

*Management of School Cafeterias.*—It was significant that 90 per cent of the systems placed the cafeteria, its maintenance and usefulness, under the board of education. This overwhelming reply in favor of the board of education control shows the trend of school lunch management. This challenging emphasis brings home more clearly the necessity of a closer tie-up between this agency and health instruction.

## PERSONNEL PROBLEMS

The problem of personnel training and qualifications, although recent, is nevertheless very important. Many teachers' colleges and graduate schools of education are now offering courses in this field. It remains for the school administrators to recognize the need for general training of teachers in the elementary grades and special training for the teachers of health in the secondary schools.

*Teaching Certificates.*—Only 20 per cent of the cities had special certificates for teachers of health instruction in the secondary schools. It further appears that these were the largest cities. This step would appear logical in a large system with extensive secondary schools if health teaching is to be elevated to the dignity of other subjects in the curriculum.

## POLICIES IN HEALTH EDUCATION

The policies pursued in all cities sending replies proved interesting and enlightening. It is quite evident that the outstanding need is a philosophy of health education. With the accepted principles from such a philosophy, the movement would have a guide to steer it through its youthful stage of development. Activities, content, and devices would then be tested by approved standards and not alone by the trial-and-error method. This problem presents another possibility for some research worker to contribute to the health education movement.

*Weighing and Measuring Reports.*—The policy of sending notices of

weights of children home to parents was diverse. The fact that 55 per cent of the cities chose to pursue this policy proves that many consider it worth while. One mid-western city in answering this question replied "when necessary." A southern city answered, "This year an effort has been made to re-educate children, teachers, and parents with regard to weighing and measuring so that they will consider this an educational procedure to show that normal growth will mean a steady increase in weight rather than a measure according to some average standard." A far western city remarked, "This applies to elementary schools and is optional; most schools follow suggestions; cards are also optional." A large eastern city replied, "No uniform practice; the matter is left to the judgment of the principal." Another large eastern city favored sending notices only "if underweight or overweight." One of the progressive smaller systems of the west answered "sent with complete report on medical and physical examination to parents." A noticeable fact was that the smaller systems used this policy more rigidly. The larger school systems allowed elasticity and permitted the individual school to do or not as it saw fit. On the whole such a policy presents great possibilities of a tie-up between home and school if the plans involved do not call for excessive clerical work and unnecessary consumption of the time and energy of the teacher.

*Daily Classroom Health Inspection.*—The policy of daily classroom health inspection by the teacher met with favorable replies from 70 per cent of the systems. One southern system replied, "The board of education has ruled that daily inspection is to be done by the teachers. Through the work of the school nurses an effort is being made to train our teachers concerning daily inspection." A large eastern system answered "compulsory in elementary schools." Another large eastern city answered "yes" and sent a lengthy syllabus on the subject. The methods employed by the cities replying ranged from brief, hurried inspections to well organized and carefully developed programs taking fifteen minutes daily.

The larger cities seemed to favor this idea. Probably the concentration of population in congested areas has given rise to the necessity of inculcating proper habits. Then again the sudden appearance of epidemics has convinced school officials of its usefulness as a supplement to the health agencies. In the matter of prevention, the classroom teacher forms the first line of defense.

*Textbooks.*—All but four of the cities required textbooks to be used at some time. One large northern city answered "by pupils—no, by teachers—yes." And a large city nearby said "to some extent." A southern city favored "a supplementary reader for second and third grade, a textbook for fourth and fifth grades." A southern city known for its progressive health program answered "health readers." One city in California replied "state text used." The fact that 80 per cent of the

systems favored the use of texts in some grades shows the field for such work. The variety of replies may be attributed to the lack of suitable texts judged from their educational suitability rather than technical content and authorship. But of recent years the publishers have sensed the importance of this field and have begun to publish a more usable type. Out of this interest should come texts which will measure up to pedagogical, psychological, and scientific requirements.

*Commercial Health Material.*—Seventy-five per cent of the cities permitted the teacher to use commercial health material. The general tendency of the others seemed to be to leave it to the judgment of the teachers. One southern city replied "material of strictly advertising nature is not recommended but we do receive some excellent material from some commercial agencies which we can adapt and use to good advantage." Two of the larger cities permitted the use but only with the permission of the board of education. It is probable that these cities have found from experience that some form of censorship is necessary. Of the four cities allowing pupils free use of commercial health material, a noticeable fact was that no one of these cities had either a course of study or director. It appears evident that if schools are to exercise their function of teaching, they should also exercise supervision over the instruction and content. It is equally important that schools exercise their prerogatives in the matter of using commercial health material. To forbid its use entirely would be folly since it helps to keep the budget reduced. Much of the material is the work of able men and women educators in the employ of commercial organizations. Their work is often highly acceptable. Then again some material is worthless. It becomes a problem of exercising a close supervision over the material used, and this responsibility should be taken by the board of education and not by the teacher.

## PROCEDURES IN HEALTH EDUCATION

*Weighing and Measuring.*—The procedures used throughout were fairly uniform. But here again the schools should be guided by research and a sound philosophy. The frequency of weighing children as an educational procedure varied. Eight cities favored monthly weighing of children; six cities favored twice a year; and only three considered three times a year as ideal. One city weighed only "those underweight or overweight, monthly." It did not state how they were selected. If the usual height–age–weight chart was the final determiner, this should not be. So many factors enter in, that the practice of determining the nutritional status by a given scale is coming into disrepute. The American Child Health Association declares against its use. If a diagnosis was made by the school physician and if the pupils were under his supervision, then monthly weighing in this case is to be commended. But we here distinguish between the clinical and educational use of weighing.

*Varied Activities.*—In answer to the question, "Are any of the fol-

lowing activities carried on by children for the purpose of increasing health knowledge or habit formation?" the replies showed that all but one of the cities were carrying on some of those listed. Ninety per cent of the cities were in favor of making health posters. Education has just emerged from a siege of poster-making and it seems natural that health should be included. Poster-making as an activity is to be encouraged if the content is related, and the work is of the standard set by the art department. Undirected poster-making is valueless, but under proper supervision this activity can be made a great ally of school health work.

Making health books was also favored by 90 per cent of the cities. This activity is to be encouraged because children associate the health habit under consideration with an appropriate picture which they have selected personally. This offers great opportunities, particularly in the elementary grades.

Some 80 per cent of the cities favored the keeping of notebooks. Since health instruction should be as definite as any subject, this activity should also be encouraged. Notebooks make for definiteness of subject matter, and are permanent records which the pupils have for necessary reference.

Health clubs were listed as important activities, and were favored by 70 per cent of the cities. Clubs properly supervised and guided can be made a vital part of the extra-curricular health activities. First-aid clubs and life-saving clubs, for example, can add to the strength of a health program.

Height and weight records were considered favorably by 65 per cent of the cities. This is a good device for interesting children in health and growth. These records should be private and kept by the pupil subject to the teacher's scrutiny. No reference should be made to existing height–age–weight charts nor should group or class records be kept on public display. This activity can add to the effectiveness of the program if children are encouraged to compete against themselves, to see themselves grow.

Only 50 per cent of the cities favored pupil supervision of ventilation. Of course the pupil never displaces the teacher responsibility for keeping the room at normal temperature, but the teacher, using discretion, can utilize the pupils for marking the temperature chart at stated times and notifying her when the temperature is not correct. Furthermore the pupils can adjust the windows, if no danger is attached. This offers a responsibility to the pupil and opportunity for performing a health activity.

Animal experimentation, a rather new activity, found only four cities favorable although it has received prominence of late in some health programs. Great care must be exercised in animal experimentation by pupils. Maud Brown found that it was discomforting for elementary pupils, because animal analogies were too strong. Then there is the ever-

present danger that the child's attention may be focused on the experiment as a device rather than the outcome of health incentives. More often is animal experimentation by children in error for they learn that certain foods are bad. This is not always the correct procedure. The purpose should be to prove that the absence of certain foods may be harmful. For example, white bread is not necessarily harmful but should not exclude other foods more important.

Thus the dangers attendant on animal experimentation by pupils are so numerous that any good that may come is minimized. It would seem to be a safe policy to exclude animal experimentation from the health education program.

## CONCLUSION

An analysis of the replies revealed some very interesting and worthwhile data on health education programs as they now exist in representative American school systems. The variety of practices discovered lead to the necessity for a more uniform program based on a sound philosophy which will meet the needs of the average school system. This program should not call for a costly addition to the school system but rather by utilizing already existing agencies and by a changing of the educational attitude indicate how the school health work may be made more effective.

# Skeletal Characteristics of the High Jumper*

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## THE PROBLEM

SHOULD coaches select men for training in high jumping in terms of physical stature? The question has often been raised but no scientific data have been collected to give any adequate answer. Therefore, the author of this report secured various measures of approximately six hundred men and analyzed the data to discover what measures, if any, might be helpful in predicting future success in the high jump.

In this study physical stature refers to those anthropometric measures, that, in the opinion of track coaches, have the greatest bearing on ability in the running high jump. The investigation has endeavored to determine the extent to which the measures selected are related to high jump ability. The anthropometric items that were measured were determined as a result of the consensus (of opinion) of track coaches. The items they selected were weight, height, length of legs, breadth of foot, and girth of hips.

The criterion was ***height of jump,*** without any attempt to control the style of jump. The different styles of high jumping are the scissors style, eastern roll, western roll, or such a modification of one of these styles as would make it an individualistic style.[1]

The usual procedure for selecting men for the running high jump has been guided by the opinions of track coaches as to the type of individual that would make a good high jumper. Very little material, if any, has been developed scientifically to determine the degree to which the coaches' opinions are correct or incorrect.

It seems logical to believe that height and long legs have some advantage in high jumping. Bemies, in an inconclusive study[2] comparing only 5 athletes with 2,300 students, found that the athletes were

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* This report is a summary of certain findings reported in the author's Ph.D. dissertation entitled, "The Relation of Physical Stature to Ability in the Running High Jump," completed at New York University, School of Education, in 1934.

[1] R. L. Templeton, "The High Jump," *Spalding's Athletic Library, 505 S* (1930), 9-27.

[2] C. O. Bemies, "Physical Characteristics of the Runner and Jumper," *American Physical Education Review,* V (Sept., 1900), 235.

slightly taller than the average and had shorter bodies and longer legs than the average. Various other researchers have made similar studies.

## SUBJECTS

The subjects were divided into two groups, a *non-track* group and a *track* group. The non-track group consisted of 561 men who had never received any specific training in the running high jump as members of high school or college track teams. The track group consisted of 16 men who had had specific training in the running high jump as members of college track teams.

The following limitations apply to the members of the non-track group:

1. All the subjects were from one institution.

2. All the students were city-bred, residing within the metropolitan area. Approximately 90 per cent of the students were native born, but about 80 per cent of the total number of students came of parents both of whom were foreign born.

3. Skeletal measurements were taken of all the male students reporting for physical education activities.

4. The high jump test was held indoors. The subjects jumped from an ordinary wooden floor and landed on a mat.

The following limitations apply to the track group:

1. The track group consisted of high jumpers, throughout the country, who had attained the height of six feet or over in the running high jump. No attention was paid to whether this mark had been made indoors or outdoors.

2. The members of the track group were measured by the track coaches, in accordance with instructions sent them by the investigator.

## CRITERIA

In the consideration of the factors covered in the investigation, it is recognized that if there is a relationship between physical stature and ability in the running high jump, there should be evidence:

1. That there is a relationship between certain skeletal measurements and high-jumping ability.

2. That combinations of these skeletal measurements will give a higher relationship with jumping ability than any of the single measures.

3. That a regression equation can be developed from the data of the non-track group to indicate the height to which an individual may be expected to jump, in terms of certain skeletal measurements.

4. That when the prediction or regression equations of skeletal traits, as formulated from a study of the non-track group, are applied to the track group they will reveal special symmetries peculiar to the expert jumpers of the track group.

## TECHNIQUE OF THE INVESTIGATION

### A. Collection of Data—Non-track Group

The investigation involved the taking of the physical measurements that resulted from the consensus (of opinion) of the track coaches, securing the best high-jump record of each individual, and the recording of the data.

1. *Measurement of Physical Stature.*—(*a*) Instruments used: All of the anthropometric instruments used were those made by the Narragansett Machine Company of Providence, Rhode Island, employing both English and metric units.

Weight—the weight was taken by means of an anthropometric scale, No. 590 D.[3]

Height—the standing height was taken with a stadiometer, No. 591, made according to the Standard of the American Association for the Advancement of Physical Education, with the base eighteen inches square and fifteen inches high.[4]

Length of legs and girth of hips—these measurements were taken with the anthropometric tape No. 586, designed by Gulick. This tape has a 6-oz. spring attachment "to eliminate the personal equation of different examiners."[5]

Breadth of foot—the shoulder breadth caliper, No. 593, or sliding arm caliper, was used to secure this measure.

(*b*) Technique of measuring: All measurements were made with the subject wearing a track suit, i.e., running trunks, sleeveless jersey, and supporter; no shoes or socks were worn. The measurements were recorded in metric units.

The location of the anatomical points for measuring was based on the Report of the British Association on Anthropometric Investigation,[6] and the writings of J. W. Seaver,[7] R. Franzen,[8] and B. T. Baldwin.[9]

Weight: This was taken by the scale, with the subject standing erect in the center of the platform, weight evenly distributed on both feet, and back turned toward the reading scale. The weight was recorded in kilograms to one decimal place.

Standing height: Determination was made by means of the stadiometer, with the subject standing erect, heels together, weight evenly distributed on both feet, and back in contact with the measuring rod.

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[3] Narragansett Machine Company, *Gymnastic Apparatus*, Catalog F 16 S (1930), 159.

[4] *Ibid.*, p. 154.

[5] *Ibid.*, p. 153.

[6] "Anthropometric Investigation in the British Isles," *Report of the Committee of the Royal Anthropological Institute* (1909), pp. 13-27.

[7] Jay W. Seaver, *Anthropometry and Physical Examination*, pp. 6-7.

[8] Raymond Franzen, *Physical Measures of Growth and Nutrition*, pp. 105-7.

[9] Bird T. Baldwin, *The Physical Growth of Children from Birth to Maturity*, pp. 19-27.

This position was secured by bringing the heels, buttocks, the spine between the shoulders, and the back of the head in contact with the measuring rod. The height was recorded in centimeters to one decimal place.

Length of legs: This measure really includes the length of the thigh and the length of the lower leg. It was taken by means of a tape measure, from the upper edge of the great trochanter of the femur to the tip of the external malleolus or lower end of the fibula. Both right and left leg were measured and the two averaged together. The average leg length was recorded in centimeters to one decimal place.

Breadth of foot: This measurement was taken by means of the sliding arm caliper, with the subject standing on the take-off foot only, that is, the foot last to leave the ground in the running high jump. The heel was raised off the floor so that the weight of the entire body was on the ball of the foot. The measurement was taken across the heads of the metatarsals, i.e., from the prominent point on the inner side of the joint at the root of the great toe, to the prominent point on the outer side of the foot at the base of the little toe. It was necessary, in some cases, to have an assistant aid the subject in maintaining his balance. The breadth of the foot was recorded in millimeters.

Girth of hips: This was determined by means of a tape measure, with the subject standing erect, heels together. The tape was passed horizontally over the protrusion of the gluteal muscles, the landmarks being the upper edge of the great trochanters. The girth of hips was recorded in centimeters to one decimal place.

(*c*) Objectivity of the measures: In order to check the objectivity of the measures, a test group of 25 students was measured and remeasured. The coefficients of correlation between the two sets of measures were found to range between .9995 $\pm$ .0001 and .9684 $\pm$ .0084, indicating a high degree of objectivity of measurements.

2. *High Jump.*—In the high-jump test, three trials were allowed at each height, the bar being raised one inch at a time. Failure to jump over a given height after three attempts, terminated the test for the subject.

### B. Collection of Data of the Track Group

The measurements of the track group were supplied by the track coaches, in accordance with instructions sent them by the investigator. The track coaches recorded, on the forms supplied, the best jump made by those members of their track squads who had attained the height of six feet or over in the running high jump.

### C. Organization of Data—Statistical Technique

The present study has sought to investigate the relation of physical stature to ability in the running high jump. The relationship of certain

skeletal measures to the high-jump ability of the non-track group was determined. The skeletal or physical measures were then combined in various combinations. From the data of the non-track group, that combination of skeletal measures was secured which had the maximum relationship with high-jump ability with a minimum number of measurements. The members of the non-track group who jumped highest were compared with those in the lowest percentile to see if the combination of skeletal measures selected was prominent in the men who jumped best.

Regression equations were developed from the data of the non-track group to predict, in terms of certain skeletal measurements, the height to which an individual might be expected to jump. Regression equations were also formulated to determine the expectation of skeletal symmetry. The skeletal regression equations were applied to the data of the track group to see whether the expert jumpers had any special skeletal symmetries.

The skeletal regression equations were also applied to the members of the non-track group who were like the track men in gross measurements, to see if they had the symmetries found among the track men. In this way, the skeletal symmetries peculiar to the track group were determined.

## RESULTS

### A. Relation of Skeletal Traits to High Jumping of the Non-Track Group

1. *Relation of Each Skeletal Measure to High-Jump Ability.*—The data of the non-track group were used to study the relations of physical stature to high-jump ability. The first relationship that was found was that of each of the skeletal measures (weight, height, length of legs, breadth of foot, and girth of hips) to high jumping. The intercorrelations of the freshman and sophomore groups were computed to find out to what extent the two groups were similar and to see with what justification they might be combined for comparison with the junior-senior group.

By use of the formula[10] for the standard error of difference, the range of the differences between the means of the freshman group and the means of the sophomore groups was found to be from .1116 sigma to 1.6249 sigma. This is not a significant difference, since according to Garrett, a value of 3 sigma is necessary to indicate a real difference.[11] Because of the similarity of measures and for simplicity of comparison

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[10] $\dfrac{N_x - M_y}{\sqrt{\frac{\sigma x^2}{N_x} + \frac{\sigma y^2}{N_y}}}$ Where $x$ and $y$ are the two measures being compared and $M_x$ and $M_y$ are the means of the two traits. Raymond Franzen, *Physical Measures of Growth and Nutrition*, p. 127.

[11] Henry E. Garrett, *Statistics in Psychology and Education*, p. 133.

with the junior-senior group, the freshman and sophomore groups were considered as one group.

The relationships of each of the skeletal measures to high jump for the freshman-sophomore group and for the junior-senior group are shown in Table I (below), ranked according to size of the coefficient of correlation.

TABLE I

RELATION OF SKELETAL MEASURES TO HIGH JUMP

*Correlation Coefficients*

| Rank | Freshman-Sophomore Group | | Junior-Senior Group | |
|---|---|---|---|---|
| 1 | Length of Legs | .2502 | Length of Legs | .3683 |
| 2 | Height | .2096 | Breadth of Foot | .1838 |
| 3 | Breadth of Foot | .0605 | Height | .1728 |
| 4 | Weight | .0197 | Girth of Hips | —.0440 |
| 5 | Girth of Hips | —.0120 | Weight | —.1126 |

In both groups, the first three measures in rank in relation to performance in the high jump are length of legs, height, and breadth of foot; with weight and girth of hips as the last two in rank. The relations are low but consistent, in that the first three measures are the same in both groups, and that length of legs is the most important measure. The two groups were treated separately because the coefficients of correlation of the junior-senior group were higher than those of the freshman-sophomore group.

2. *Relative Emphasis of the Skeletal Measurements to High Jump Ability.*—To find the greatest relationship of combinations of the skeletal measures, which constitute groups of variables, to high-jump ability, the multiple correlation formula was used. The multiple correlation coefficient is an expression of "the relationship existing when we have the best possible weighting of each of the component parts."[12]

As a result of the above procedure in determining the relative emphasis of the skeletal measurements to high-jumping ability, that group of measures was selected which had the maximum relationship to high-jumping ability with a minimum number of measurements. The combination of skeletal measures selected to predict the expected height to which an individual will jump, included those of height, length of legs, and breadth of foot. These measures have the greatest zero-order relationship to high jumping. In the junior-senior group, when the above measures were combined, the highest multiple correlation (.4378) was obtained for the 3-variable combination. In the freshman-sophomore group, the above combination of measures resulted in a coefficient of .2560. This was slightly smaller than the result obtained from the highest 3-variable combination (.2776). In other words, in the freshman-sophomore group this combination did not result in the highest multiple correlation for the 3-variable group. It was nevertheless chosen, because

[12] Franzen, *op. cit.*, p. 21.

of the high relationship of these measures in the junior-senior group, and in order to have a consistent group of measures. Since the relationship coefficients were only slightly less than for the best four- or five-variable combination, the taking of one or two additional measures did not seem to be warranted.

| | *Freshman-Sophomore Group* | *Junior-Senior Group* |
|---|---|---|
| Selected Combination (Three Variables) ..... | .2560 | .4378 |
| Four Variables ..... | .2780 | .4499 |
| Five Variables ..... | .2780 | .4593 |

The skeletal variables have little influence on the height to which individuals jump, but insofar as there is a relationship, it is best reflected by a combination of height, length of legs, and breadth of foot.

B. Comparisons of Track and Non-Track Group

The correlations of the physical measures of the non-track group and high-jump performance were too low for predictive purposes. Then, the non-track men were compared with the expert jumpers to see if the two groups differed skeletally. The steps in the procedure to determine skeletal differences were:

*a*) Comparisons of the means of the non-track group with the measures of members of the track group.

*b*) Comparison of the residuals of members of the non-track group who are like the track men in their gross measurements, with the residuals of the track men.

The following results were obtained:

1. Comparing the dimensions of each individual of the track group with the means of the non-track group:

| | *Track Group* | *Freshman-Sophomore Group* | *Junior-Senior Group* |
|---|---|---|---|
| Height | Greater | 170.9316 cm. | 170.5740 cm. |
| Length of Leg | Greater | 81.6174 cm. | 80.7180 cm. |
| Breadth of Foot | Greater (except in two cases which reach 95.0 mm.) | 95.1014 mm. | 94.3820 mm. |

The means of the measures of the non-track group are smaller than the measures of any member of the track group (except for 2 cases, breadth of foot being equal to 95.0 mm., against a mean of 95.1014 mm.). All the members of the track group are taller than the means of the non-track group. The expert jumpers have longer legs and broader feet than the means of the non-track group.

The members of the track group excel, then, in those skeletal measures—height, length of legs, and breadth of foot—selected as having the greatest bearing on ability in the running high jump.

2. When the skeletal prediction formulas derived from the data of the non-track group were applied to the track group, it was found that all sixteen cases of the track group have minus residuals for height, indicating that every member of the group is shorter in height than would be expected from his length of legs and breadth of foot. Despite this fact, however, these individuals are taller than the average for the non-track group.

The reverse is true of the residuals of leg length. In predicting the length of legs from height and breadth of foot, the residuals are all plus, as the actual skeletal measures are much greater than the expected measures. This indicates that every member of the group has legs extremely longer than would be expected from his height and breadth of foot.

When the expectation of foot measure from height and length of legs was secured, it was found that six members of the track group had minus residuals, and the other ten had plus residuals. This indicates that there is no distinction possible as to the foot measure being above or below expectation, although they have broader feet than the average.

Other analyses were made, too involved and detailed to report here, which led to the conclusion that the following characteristic symmetries may be noted for the members of the track group. Their most significant peculiarity is the extreme length of their legs. They are above the average in height, yet the height is less than might be expected from their other skeletal measurements. That is, their bodies, excluding the long legs, are relatively short. Their breadth of foot, while above the average, does not seem to be significant, since it appears to be a function of their long legs and height rather than a distinctive characteristic.

These conclusions were checked by comparing these athletes with the non-track men who are like them in gross measures, to see if the above factors exist in the non-track men.

To determine if the symmetries found among the track men would be found among non-track men who are above the mean in height, length of legs, and breadth of foot, sixteen men were selected at random from the non-track group and their skeletal measures applied to the skeletal regression equations.

It was found that some of the cases have minus residuals for height expectation and the others have plus residuals. The same thing is true for expectation of length of legs and breadth of foot. Expressed in another way, some individuals are taller than would be expected from their leg length and foot breadth, and some shorter. This is also true of leg-length expectation from the other two measures, some falling

above and some below expectation. In prediction of foot breadth from height and leg length, some of the cases are larger than would be expected from the other skeletal measures, and some are smaller than would be expected.

Since the above tends to indicate that these same symmetries would not be found among the non-track group, it may be said that there are skeletal symmetries peculiar to the track group, and they are: long legs, a short body, and broad feet.

C. Findings

1. There is no real difference in the relationship of the skeletal traits to high-jumping ability between the freshman group and the sophomore group. Also, there is no real difference in the relationship of the skeletal measures to one another, thus, permitting the use of the two groups of data as an aggregate.

2. In the freshman-sophomore group and in the junior-senior group the three skeletal measures having the greatest rank-order relationship to high-jump ability are length of legs, height, and breadth of foot.

3. The means of the freshman-sophomore group are lower than for the junior-senior group in height of jump, weight, and girth of hips; and are higher in height, length of legs, and breadth of foot.

4. The junior-senior group have a smaller measure of variability or a greater concentration around the mean in all the variables, with the exception of girth of hips.

5. The skeletal variables have little influence on the height to which individuals jump, but insofar as there is a relationship, it is best reflected by a combination of height, length of legs, and breadth of foot.

6. In the non-track group the men who jumped highest were taller, had longer legs, and broader feet than those in the lowest percentile.

7. The expert jumpers who make up the track group have skeletal symmetries that are peculiar to them. They are above the mean of the non-track group in height, in length of legs, and in breadth of foot. Their height is below the expectation for their length of legs and breadth of foot. The length of their legs is extremely above the expectation for their height and breadth of foot. In breadth of foot, they do not vary distinctively from the expectation for their height, and length of legs.

8. Members of the non-track group who are above the mean in height, length of legs, and breadth of foot, do not have the skeletal symmetries found among the track men.

9. The type of individual that succeeds in the high jump has long legs, a short body, and broad feet.

10. The consensus (of opinion) of the track coaches as to the physical measures that have the greatest bearing on ability in the running high jump has been partially verified. The judgments of the track

coaches have been justified for three of the five skeletal measures they suggested. The coaches over-rated the importance of the measures they selected, however, since the relationships found are lower than might have been expected.

## RECOMMENDATIONS FOR FURTHER STUDY

1. This study involved the students of one institution, many of whom were of the same derivation. It is suggested that, if possible, a study be made in different types of schools, i.e., urban and rural schools, located in various parts of the country, rather than one restricted to one area, as was the case with the non-track group.

2. There should be some way of measuring the amount of work done, in terms of foot-pounds raised, with the foot as a lever. The pressure exerted on the ground in the take-off might be recorded. Some sort of leg-pressure device might measure the amount of muscular contraction.

3. A group should be given specific training in the running high jump for a definite period of time, and a learning curve secured, indicating the difference between the maximum jump before and after training. When the plateau in the learning curve had been reached, there would be an elimination of the unknown variable attributable to training. The three measures of length of legs, height, and breadth of foot might then be used as the starting point for further investigation.

## REGRESSION OR PREDICTION EQUATIONS

(Metric Units)

### A. *Skeletal Regression Equations—Non-Track Group*

1. Freshman-Sophomore Group

Expectation of Height = 1.0239 Length of Legs + .1666 Breadth of Foot + 71.5197

Expectation of Length of Legs = .0458 Breadth of Foot + .4334 Height + 3.1800

Expectation of Breadth of Foot = .2433 Height + .1579 Length of Legs + 40.6263

2. Junior-Senior Group

Expectation of Height = 1.1204 Length of Legs + .1524 Breadth of Foot + 65.7538

Expectation of Length of Legs = —.0055 Breadth of Foot + .4880 Height — 2.0030

Expectation of Breadth of Foot = .3311 Height — .0003 Length of Legs + 37.9291

### B. *High Jump Regression Equations—Non-Track Group*

1. Freshman-Sophomore Group

Prediction of High Jump = .1250 Height + .5365 Length of Legs — .0504 Breadth of Foot + 66.5387

2. Junior-Senior Group

Prediction of High Jump = — .4940 Height + 1.5216 Length of Legs + .3376 Breadth of Foot + 57.8177

# Body Form and Athletic Achievement of Youths

By Dr. Emil Breitinger

*Translated from the German and condensed by Ernst Thoma, Instructor in Physical Education, Washburn School, Cincinnati*

IN A BOOK of 104 pages the author describes and tabulates the results of a fine and thorough piece of research work in physical education. His numerous references to results of researches made by others are interesting and illuminating; likewise his comparisons of his results with those attained previously in Germany and in other countries.

In the introduction he explains that his object in the investigation was to determine if the correlation between body form and physical achievement is sufficient to warrant the demand that in the evaluation of pupils' physical fitness their physical characteristics be taken into consideration.

The work is in three parts, as follows:

1. Physical measurements of some three thousand Munich high school boys, ten and one-half to twenty years of age.
2. Athletic Achievement Tests of these pupils.
3. Correlative dependence of the achievements to the physical characteristics.

## PART I

The measurements were taken in winter of 1930-31, November to May. They were the following:

1. Body height
2. Shoulder height
3. Middle finger-tip height
4. Iliac crest height
5. Great trochanter height
6. Breadth of shoulders
7. Breadth of hips
8. Girth of chest
9. Girth of upperarm stretched
10. Girth of upperarm bent
11. Weight

The achievement tests were made in spring, 1931, May and June. Events were chosen in which native talent, rather than acquired skill, is the determining factor for success, which can be accurately measured, are least affected by extraneous influences, and are not too strenuous for the younger groups. These were:

1. 60-meter sprint
2. Standing broad jump
3. Running high jump
4. Putting 1000 gr. medicine ball (*Vollballwurf*)
5. Baseball distance throw (*Schlagball*—80-90 gr.)

Together these events were assumed to indicate the strength of the whole musculature and the fitness of heart and lungs.

To get relative proportions the various measurements were figured in percentages of the entire body height.

For purposes of classifying the material the ages were grouped at intervals of one-half year. Ages were taken at time of measuring. The error resulting from taking the tests several months later could not be eliminated for various reasons.

Formulas for determining the correlation between each body measurement and each event, thirty-four in all, were established.

Two thousand, nine hundred and thirty-nine pupils were measured, but only about two thousand, three hundred of these participated in the tests. Membership in *Turnvereine* and sport organizations and the like were noted.

Numerous charts and tables illustrate the various results.

Height measurements show by comparison with former measurements that the bad effect on height caused by the War and the inflation period were already compensated in 1925-26, indicating that body height was not as lastingly affected as was growth in volume and breadth.

The chart of relative differences substantiates the periods of growth in the second decade of life of the male European as established by Martin in 1928, as follows:

5-6 years to 10-12 years, slow growth
10-12 years to 16-18 years, rapid growth
16-18 years to 25 years, slower growth

Until the age of puberty the legs grow faster than the trunk, after which the trunk grows faster.

The length of the arms correlates quite closely with that of the body height throughout the various age periods.

The weight chart indicates that the retardation due to Germany's years of stress has not quite been regained.

Increased chest and shoulder breadth measurements as compared with former statistics are attributed not only to better economic conditions but to increased physical exercise.

Summing up the most important anthropometrical results, a comparison with records taken five years previously shows increases in weight and breadth but none in height measurements, which remain the same.

The growth of body parts shows the well-known periodicity. The accelerated adolescent period growth sets in for all parts of the body at about the same time but lasts longer with regard to weight and breadth than to height.

With increase in total height in all one-half-year-age groups, there

is an unequal absolute growth increase in body parts, greater in length than in breadth, but a decrease in relative values, except in length of legs, especially of the trunk.

PART II

The results of the tests are also shown in the same order and by charts and tables as the measurements.

The sprint tabulation shows an increased ability in all age periods, but especially during adolescence, between twelve and sixteen years, corresponding with the accelerated growth in height, indicating that the development of heart and lungs keeps pace with that of the body height.

The standing broad jump records show the same result.

The high jump shows rapid increase from eleven years up and slackens at sixteen and one-half years, contrary to the broad jump which shows the best increases after thirteen and one-half years. This shows that other factors than merely jumping energy are involved in the high jump: coordination.

Putting the medicine ball shows gradual increased achievement throughout, especially on the chart of percentage to average height. The strongest point on the curve is between the eleventh and sixteenth years, the period of greatest growth in height.

Due to the fact that practice is a greater factor in improvement and that the same weight of the ball for all ages constitutes, biologically, different demands at various age periods, the increase at nineteen years over the ten and one-half year group is 312 per cent, in contrast to only 145½ per cent in running high jump and 141 per cent in standing broad jump.

Baseball throw shows us acceleration at puberty age; it does not involve the entire body as much as throwing the medicine ball, nor can the light weight of the ball influence, biologically speaking, the performance at different age levels. The propelling force and the skill in throwing almost doubles from ten and one-half years to nineteen years, 197.02 per cent.

*Summing up the results of the achievement tests the records show:*

1. A marked superiority in almost all events over like Norwegian and Czechoslovakian records taken eight years previously.

2. The development of athletic achievement and body growth are parallel. The events show individual rhythm in development which is associated with their various physiological practice values. There is no evidence of a diminished ability at the onset of adolescence.

The uninterrupted increase in absolute achievement demands that in judging athletic achievements of youths, no greater lengths of age periods than one year should be used and never should classification be based on membership in school classes.

## PART III

The study of the correlation between physical achievement and height shows a positive correlation in the sprint between 12 and 17 years and practically none before that or after. This verifies the fact that, especially during adolescence, the tall pupils have the advantage in speed. Also the jump shows a moderate positive correlation to height between 12 and 18 years. The average achievement increase in 10 c.m. body height is given as 9.4 c.m. in standing broad jump and 5.3 c.m. in high jump. The qualification chart shows the medicine ball throw well ahead of the other events: the positive correlation is indisputable between the eleventh and nineteeth years. The baseball throw, however, is just as clearly below, only the 13-year group barely qualifying. In practice, therefore, in judging achievements of pupils from 10 to 20 years, the body height could well be ignored in the baseball throw, but in the heavy medicine ball throw it must be taken into consideration.

*Summing up the correlative dependence of athletic achievement on body height, there is evidence of:*

1. A difference in degree in the various events. The baseball throw is as good as independent. The increases in the correlative values of the sprint, and the jumps, and the medicine ball throw coincide with the sequence to be expected from their characteristic physiological practice value.

2. A plainly evident age difference. The strongest dependence is shown to be in the adolescent period of accelerated growth. It is diminished in the younger and older brackets.

In the "Correlative Dependence of Weight on Achievement," the "Qualification Chart of the Sprint" shows negative in the younger groups and positive from fourteen to eighteen years. It is not much different than its correlation with height. The same relation exists in the jumps. The medicine ball and the baseball throws are again very different in their relation to weight. The medicine ball curve is well above the others and clearly positive in all ages. The baseball curve in contrast runs together with the jumps and the sprint and becomes clearly positive only between fourteen and one-half and eighteen years. This indicates plainly the advantage of weight grouping over that of height in the throwing events.

*Summing up the "Correlative Dependence of Athletic Achievement on Weight" the results are as follows:*

1. It is strongest in events where a foreign weight is propelled and increases with the weight of the object. In events where the own body weight is propelled it is decidedly less and about the same in all.

2. The positive correlations cover a smaller age span in the jumps

(fourteen to eighteen years) and greater in the throws (ten and one-half to nineteen years) than in the height grouping. As to height plus weight in their relative significance for athletics, in the sprint the correlation to height is moderately positive from eleven to fourteen years, after which it fluctuates. The correlative weight, however, is negative from eleven to thirteen years, and after that positive. This means that height and weight are antagonistic to the fourteen-year period and later harmonious energy factors. This again shows the great cohesion between body form, achievement, and growth. Before and during the accelerated growth in body height, the relatively light pupils are the better runners. With the oncoming preponderance in breadth and weight growth, weight also becomes an asset.

In the jumps the height is throughout more important than weight.

The throws again take a peculiar position on the chart. Weight is more important than height, but both indicate that the successful thrower, especially of the heavy ball, must be tall and heavy. This combination, however, seldom occurs in youth, weight usually asserting itself only after the twenties.

*The summary of "Correlative Dependence of Athletic Achievement on Height plus Weight" shows:*

1. A clear difference in age. It shows indisputably the close association of the correlation of physiological growth with height and weight. Until the climax of the accelerated growth period (fourteen years) the large pupils average more efficient. After this, with the acceleration of growth in weight still continuing, the heavy pupils do better, especially in the throwing events.

2. Next to age, the physiological value of practice of individual events is a determining factor of the kind and degree of the correlation to the height plus weight.

From this we must infer that when we give general preference to one body characteristic in judging relative athletic achievement, we do not do justice to the physiological characteristic of the age period and the value of practice of the individual event. A way must be found that takes these facts into consideration.

*The summary of the "Correlative Dependence of Athletic Achievement on the Proportions of the Extremities" shows:*

1. Almost no connection between the length of the arm and achievement in throwing.

In running and jumping achievements, on the contrary, there is a partially established decrease in performance with increasing relative length of legs. After the sixteenth year, this negative correlation becomes less, that of the high jump even slightly positive. This again indicates the close association with the growth at adolescence.

2. The decrease in achievement with increasing relative length of legs is greatest in the sprint, less in the jumps and of these again least in the high jump.

*The summary of the "Correlative Dependence of Athletic Achievement on Relative Girth of Chest and Breadth of Shoulders" shows:*

1. A strong resemblance to the connections between achievement with weight. This, especially the relative chest measurement, is primarily in regard to age differences. The achievement correlations to relative shoulder width show less age differences and lower average value.

2. The correlative values of individual events differ clearly in regard to relative chest measurement. In regard to relative shoulder breadth there is a smaller difference.

3. Unescapable again is the well-defined association of the findings with the adolescent growth. Only when the acceleration of growth in width has become effective do the relatively broadly built pupils show their superiority over their more slenderly built comrades.

*Summary of the "Important Findings Regarding the Correlative Dependence of Athletic Achievement on Body Form":*

1. In harmony with results attained by others, it is found that in almost all correlations, there is a clear age difference, some harmonious, some antagonistic value differences. The greatest values coincide mostly with the accelerated growth during adolescence. This phenomenon is most evident in the correlation of achievement with height plus weight.

2. The findings in the relations of the achievements to the relative form characteristics of the body make an association with the constitutional types of pupils probable. The poorer achievements of the relatively long-legged ones would be attributable to the leptosomatic and asthenic types, the better than average performance of the relatively broadly built to the eurysomatic. Relatively long arms are evidently without significance in throwing.

In general it may be emphasized that the various correlations lead to the conviction that the individual characteristics, for instance length of legs, shoulder width, etc., do not indicate a mechanical or physiological significance; rather, the total performance is determined by the physiological age and the constitutional type.

3. This also explains the fact that better correlations were found associated with those body characteristics which are significant in recognizing age periods and types, namely, height, weight, relative length of legs, and relative chest circumference.

4. The correlative dependence of the achievement on characteristics of the body form varies greatly in extent. It depends on the physiological value of practice; the medicine ball throw records are more

dependent on all body characteristics combinations than those of the jumps and the sprint. On the other hand, the kind and degree of dependence is influenced by the body characteristics; the jumping achievements for instance are more dependent on height than weight, while the throwing achievements increase with weight more than with height.

ENTIRE REVIEW

Three thousand (in round figures) Munich (Germany) high school pupils were measured and tested and the results studied in half-year groups.

Comparison with statistics of 1923-27 show a progressive improvement of physical development; especially the volume and width development has increased in the last five years; presumably due to more physical exercise.

The excellent achievements also speak well for the efficient physical instructions of the Munich youth.

Body and achievement development, on the whole, run parallel. But just as the body characteristics, so too the individual athletic achievements show a peculiar rhythm in development.

In pupils of the same age (half-year periods) only a slight correlation between body form and athletic achievement is evident. Only during adolescence can a definite change in average achievement with the change in body form be claimed. The various characteristcs of body form and the individual athletic achievement show, in correlation, different values.

The relatively low degree of correlation verifies the pedagogical experience that, besides the external body form, which most likely is not the most important factor in athletic achievement, the aggressive will to achieve determines the outcome.

A bibliography of six pages concludes the book.

# A Curriculum Study of Physical Education Activities for the Boys and Girls of the Seventh, Eighth, Ninth, and Tenth Grades of the Public Schools of Norfolk, Virginia

## Based on Interest as Displayed by These Pupils in the Activities Offered *

By Kirk Montague

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### PURPOSE OF THE STUDY

*Statement of the Problem.*—The problem is a study of a curriculum of physical education activities for the boys and girls of the seventh, eighth, ninth, and tenth grades of the public schools of Norfolk, Virginia, based on interest displayed by these pupils in the activities offered. The physical education activities used in this study are: self-testing activities, rhythmical activities, hunting plays and games, athletic activities or contests, formalized or invented movements, as stated by Hetherington.[1] Of the formalized movements, marching and calisthenics were the only ones used. The response of the pupils to these activities will act as a guide in determining the desirability of using these activities in a physical education program for these pupils.

*Importance of the Problem.*—This problem of preparing a curriculum based on the interest of the pupils of certain grades of the schools of Norfolk, Virginia, seemed to imply the necessity of a search for those activities for which the pupils of these grades have a genuine and live interest. The safest method to gain this information appeared to be a direct presentation to them of activities and then a receiving from them of an individual expression as to their interest. Any method except secret ballot would have been fraught with the dangers attendant to mob psychology and gang leadership; also, the omission of a signature appended to the ballot kept the pupil from thinking that his opinion would be questioned by the teacher.

*Authorities' Opinion on the Importance of the Problem.*—As a proof

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[1] Clark W. Hetherington, *School Program in Physical Education*, p. 16.

of the emphasis that interest is now receiving from leading educators, Cox and Long say: "It is one of the most vicious fallacies of popular misconceptions that interest and effort are opposed to each other. Without interest there can be no sustained effort." [2] Lloyd further emphasizes the value of interest: "Interest is generally accepted as the first essential in the educational process. To what degree do the activities demand interest and its concomitant attention? What is the nature of the interest? At what age periods are interests manifested in these activities? These are questions which must be answered. The degree of satisfaction which results from engaging in the activity correlates highly with the desire to repeat the activity." [3]

## DEFINITIONS

*Curriculum.*—The curriculum is the sum or range of experiences in or outside of school—whether consciously controlled and guided, or undirected—that favorably influence the discovery, unfoldment, and development of the personality and traits of the individual, in accordance with accepted educational aims. This conception of the curriculum, which includes experiences outside as well as within the school, is consistent with the modern social view of education.[4] The main business of curriculum making is twofold: first, to know what interests, native or acquired, lie available in the child's nature; second, to know how these may be stimulated, guided, and directed so as to bring growing. One main part of our curriculum making is to know and stir interest that might otherwise be dormant.[5]

*Physical Education.*—Briefly, physical education is the administrative or teaching division of education that is concerned with the vigorous total-body activities as distinct from the manual, musical, or scientific activities, and from the tool subjects.[6]

*Interest.*—Feeling, so far as it is taken out of its isolation and put in relation to objects of knowledge or ideals of action, is *interest.*[7] The factor of interest must always be considered by those who control the study and method of the school.[8]

The interest, as a matter of Stimulus → Response structure must be present in the nervous system before it can be aroused to activity.[9] This doctrine of interest says that interest, so understood, is the guarantee of attention and effort; and that such attentive and interested effort best utilizes the laws of learnings, particularly of set, readiness, and effect.

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[2] Phillip W. L. Cox and Forrest E. Long, *Principles of Secondary Education*, p. 211.
[3] Frank S. Lloyd, *Interpretations of Physical Education*, Vol. I, pp. 172–173.
[4] T. D. Wood and C. L. Brownell, *Source Book in Health and Physical Education*, pp. 61–62.
[5] W. H. Kilpatrick, *Foundations of Method*, p. 148.
[6] Jay B. Nash, *Interpretations of Physical Education*, Vol. I, p. 3.
[7] John Dewey, *Psychology*, p. 276.
[8] J. C. Chapman and G. S. Counts, *Principles of Education*, p. 376.
[9] W. H. Kilpatrick, *Foundations of Method*, p. 148.

So stated, the doctrine of interest is nothing but the doctrine of mind-set and learning.[10]

## PROCEDURE IN COLLECTING AND ORGANIZING DATA

*Collection of Data Through Correspondence.*—In order to secure as full information as possible on the physical education activities being given at the present time in the courses of study of the states and cities of this country, letters were written to Marie Ready, Assistant Specialist in Physical Education, Department of the Interior, Bureau of Education, Washington, D. C., and to George D. Butler, National Recreation Association, 315 Fourth Avenue, New York City, N. Y., to ask for the names of the states and cities having such courses of study.

As a result of the above letters, C. W. Mason, Superintendent of the Public Schools of Norfolk, Virginia, wrote a letter to a number of State Superintendents of Public Instruction and to the superintendents of public schools in a number of the larger cities. Courses of study were received from the following states: Alabama, California, Maine, North Carolina, Pennsylvania, Virginia; and from the following cities: Denver, Colorado; Lansing, Michigan; Oakland, California; and Springfield, Massachusetts.

*Organization and Analysis of Data Obtained Through Correspondence.*—From the courses of study listed above, the investigator selected the activities which fell under the following group headings: self-testing activities, rhythmical activities, hunting plays and games, athletic activities or contests, and formalized or invented movements. Of the formalized or invented movements, marching and calisthenics were the only ones used. A list from the courses of study of all phases of these activities appearing in the above courses of study was made in alphabetical order to facilitate the use of the list. The terminology suggested by Clark W. Hetherington [11] was arbitrarily chosen to serve as the basis, e.g., apparatus work was classified as stunts or self-testing activities. The same activity often appeared in different courses of study under a different name in which case the more common name was used. In case a course of study did not differentiate the activities according to those for boys and those for girls, the investigator arbitrarily placed all these activities in the list for boys and in the list for girls. Also, when a course of study failed to note the exact grade or grades in which an activity is used in that state or city, this activity was placed in all grades. After the list from the courses of study was completed, the frequency with which each activity appeared in the courses of study was checked.

*Local Criteria.*—All activities were eliminated which did not meet the following local criteria:

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[10] *Ibid.*, p. 59.

[11] Clark W. Hetherington, *School Program in Physical Education*, pp. 16–19.

1. *Element of Time.*—Two periods of fifty minutes each week, fifteen minutes of this time each period is allowed for undressing, showers, dressing, and getting to and from place of activity.

2. *Limitations of Space.*—Smallest gymnasium floor is forty by fifty feet. Largest gymnasium floor is fifty by seventy feet. Smallest outdoor space is fifty by fifty feet. Largest outdoor space is comprised of two spaces each fifty by one hundred feet.

3. *Leadership.*—One man and one woman teacher for each school and one pianist dividing her time equally among the three women teachers.

After those activities in the list from courses of study not meeting the above local criteria had been eliminated, the remaining activities were further evaluated by the teachers of the Physical Education Department of Norfolk, Virginia, according to age, needs, and capacities of the pupils rating these activities one, two, three, or four (one being first choice). The teachers were asked to submit a list of activities not mentioned in the list from courses of study, but which in their opinion were desirable to the age, needs, and capacities of the students and the criteria established for the local conditions.

*A master list* was made containing:

1. All activities appearing in the list from the courses of study as often as 75 per cent (regardless of teachers' rating).
2. All activities rated one, two, or three by the above mentioned teachers (regardless of frequency in the list from courses of study).
3. The additional activities suggested by the teachers on the basis of local experience.

*Data Presented to Pupils for Their Expression of Interest.*—The master list was used as the basis of the seasonal, daily gymnasium activities or outdoor program of activities. The study was made in three schools: Maury High School, Blair, and Ruffner Junior High Schools, involving about 3,000 pupils who cast approximately 15,000 votes. The activities were presented during the entire school year. Maury High School physical education program is limited to the ninth and tenth grades. The junior high schools of the city are so crowded that certain ninth grades are sent to the senior high school. This does not allow the physical education program in the high school to extend further than the tenth grade. A different program is given to the ninth grade of the senior high school from that given the ninth grade of the junior high schools, i.e., football is not given to the boys in the junior high schools, and apparatus is not used in the program given to the girls in the junior high schools.

The units of the program were of six weeks' duration and coincided with the dates on which reports in school subjects were sent to parents. There were five of these units of program. At the end of the first unit of six weeks, a check of the interest of the pupils in each class period in the activities given to them during this unit was made by presenting to the

pupils for vote a list of the activities which they had participated in during this unit of six weeks. The investigator accomplished this by printing in large letters the names of the activities on a poster which was hung in the boys' gymnasium so as to be easily read by all the boys. It was explained to them that they were to vote as to their first and second choice in the activities listed on the poster. The activities receiving the highest number of votes for first choice and the activities receiving the highest number of votes for second choice would be given in their next physical education lesson. A slip of paper was passed to each boy upon which was mimeographed date, period, boy or girl, grade, school, and two lines numbered one and two to indicate the pupil's first and second choice of activities for that unit. This slip was filled in by each boy but was not signed. The investigator collected the votes and then went to the girls' gymnasium where the same procedure was followed.

The time occupied in voting and collecting votes was approximately five minutes. The investigator tabulated the results at once by a very simple method: the votes were placed on a desk in piles, each activity receiving a first choice vote being placed in a separate pile. Each pile was then counted and recorded, the activity receiving the highest number of votes being recorded as first choice; the votes were then piled again according to second choice and counted and recorded again, the highest number of votes for second choice being recorded as second choice. The total number of first choices was checked with the total number of second choices and then checked with the total number of votes. Since each pupil was given only one slip of paper, there was no chance of the total number of votes being more than the total number of pupils in a class. In case a pupil voted for only one activity, his vote was not counted and if a pupil voted for more than two activities, only the first two were counted. In a few cases, activities were voted for which were not listed on the poster for that unit, but had been given in a previous unit; these were not counted. Whenever an activity received both the first and the second choice the activity was recorded as first choice; the activity second in rank was rated as second choice. If more than one activity was selected for first choice, that is to say, received the same number of votes, both were regarded as first choice. The same procedure was followed when a tie occurred in second choice. In the next physical education lesson, the pupils were allowed to participate in the activities voted first and second choice; no pupil was forced to participate.

*Teachers' Judgment of Pupils' Interest in Activities Chosen.*—The interest displayed in these activities was noted and recorded by the teachers according to the following plan:

> Large percentage participating with great interest was rated one (1); large percentage participating with little interest was rated two (2); small percentage participating with great interest was rated three (3); small percentage participating with little interest was rated four (4).

*Teachers' Judgment of Pupils' Interest in Activities Played Outside of School.*—Incidentally, to observe the interest of the pupils in their chosen activities after school, the teachers of the Physical Education Department, due to their great interest in this problem, checked the activities participated in by the pupils to observe how much enthusiasm was displayed in these activities. The investigator also checked the reaction to all activities by the pupils in their free time.

As a result of the information gained through efforts whether formally recorded or informally noted, a course of study for the boys and girls of the seventh, eighth, ninth, and tenth grades of the Public Schools of Norfolk, Virginia, was formulated, based on the interest as displayed in the activities offered.

## SEVENTH GRADE JUNIOR HIGH SCHOOL ACTIVITIES

*The Presentation of Selected Activities to Pupils.*—After the master list made up of activities chosen by the teachers from the courses of study and from activities that had seemed valuable for local use was completed, the teachers presented these activities to the pupils. These activities were presented in groups according to units of time. A unit consisted of six weeks' duration, five school days to the week. The attempt was made in the selection of these activities to offer to the pupils a group with sufficiently varied types so that there might be a wide range of appeal. The same group of activities was presented to the boys of the seventh, eighth, and ninth grades of the junior high schools. A somewhat different group of activities was presented to the boys of the ninth and tenth grades of the senior high school, i.e., football was not given to the boys in the junior high schools. The same method was used for the girls with the difference in program for them that exercises on the apparatus were added for the ninth and tenth grades of the senior high school.

At the close of each unit, the investigator checked the interest of pupils in each physical education class by having each pupil vote by written secret ballot his first and his second choice of the activities presented by the teachers during the unit just completed. Previous to the act of voting, an announcement was made by the investigator to the pupils, that those activities voted as first and second choice of the grade would be played again in the next physical education lesson.

The investigator tabulated the results of each grade's voting and arranged the list of activities in each unit of each grade, boys and girls separately, according to rank with the activity receiving the highest number of votes in the first choice group written first; the highest in the second choice group first; under each of these first choice activities were written the other activities belonging to these two groups in the order that their number of votes accorded to them.

In the next physical education lesson, the activities that had received the first and the second choice of that grade were participated in by the pupils. The teachers observed the participation and rated the enthusiasm of this participation with the following criteria:

Large percentage participating with great interest was rated one (1).
Large percentage participating with little interest was rated two (2).
Small percentage participating with great interest was rated three (3).
Small percentage participating with small interest was rated four (4).

### SEVENTH GRADE JUNIOR HIGH SCHOOL ACTIVITIES—BOYS (Unit 1)

The boys of the seventh grade during the first unit of six weeks gave volleyball and dodgeball the highest number of votes in the first and second choice groups respectively. Skin the snake was third in both these groups. The self-testing activities, voted as a group, were popular, receiving fourth place in the first choice group and the fifth place in the second choice group. The other activities received a scattered number of votes.

*Teachers' Judgment of Pupils' Participation.*—When the activities voted first and second choice in the first unit by the boys of the seventh grade were played during the following physical education lesson, the teachers viewed their participation and rated the interest displayed by the pupils through their response to the activities according to the scale, one, two, three, or four. Volleyball and dodgeball were rated one in the first and in the second choice groups respectively.

## SUMMARY AND DISCUSSION

As a result of this study the proposed curriculum for the seventh, eighth, and ninth grades of the junior high schools, and the ninth and tenth grades of the senior high school will include certain activities whose interest for the pupils of these grades was plainly indicated by their choice.

*Junior High School Choices—Boys.*—In the seventh grade the boys voted for these activities as their first and second choices: self-testing activities; rope climb and forward roll; hunting plays and games; club snatch, prisoner's base, soccer kick relay, and basketball relay; athletic activities or contests; running high jump, volleyball, soccer, and dodgeball. All these activities were rated one by the teachers as to the participation of the pupils, with the exception of rope climb and prisoner's base which were rated two.

In the eighth grade the boys voted for these activities as their first and second choices: self-testing activities; horizontal bar; hunting plays and games; suicide and soccer kick relay; athletic activities; running high jump, hurdles, volleyball, soccer, and playgroundball.

All these activities were rated one by the teachers as to the participation of the boys, with the exception of suicide, which was rated two.

In the ninth grade the boys voted for these activities as their first and second choices: self-testing; horizontal bar; hunting plays and games; suicide, club snatch, and soccer kick relay; athletic activities or contests; hurdles, volleyball, soccer, and playgroundball. All these activities were rated one by the teachers as to the participation of the pupils, with the exception of suicide and club snatch, which were rated two.

The activities of those voted first and second choice which the teachers observed the boys of the junior high schools play after school voluntarily were: horizontal bar, prisoner's base, running high jump, volleyball, dodgeball, soccer, and playgroundball.

TABLE I

DISTRIBUTION ACCORDING TO GRADES OF ACTIVITIES VOTED FIRST AND SECOND CHOICE BY THE BOYS OF THE JUNIOR HIGH SCHOOLS

| Activity | First Choice Grades | Second Choice Grades |
|---|---|---|
| Volleyball | 7 8 9 | 8 |
| Soccer | 7 8 9 | |
| Running High Jump | 7 8 | |
| Hurdles | 8 9 | 8 9 |
| Club Snatch | 7 9 | |
| Rope Climb | 7 | |
| Suicide | 8 | 9 |
| Horizontal Bar | 9 | 8 |
| Soccer Kick Relay | | 7 8 9 |
| Dodgeball | | 7 9 |
| Playgroundball | | 8 9 |
| Basketball Relay | | 7 |
| Forward Roll | | 7 |
| Prisoner's Base | | 7 |

*Teachers' Judgment of Pupils' Participation.*—The participation of the boys in all first and second choice activities was rated one except for the following which were rated two.

TABLE II

TEACHERS' RATING OF BOYS' PARTICIPATION

| Activity | First Choice Grades | Second Choice Grades |
|---|---|---|
| Rope Climb | 7 | |
| Club Snatch | 9 | |
| Suicide | 8 | 9 |
| Prisoner's Base | | 7 |

The following were the activities of those voted first and second choice which the teachers observed boys play voluntarily after school: volleyball, soccer, running high jump, horizontal bar, dodgeball, prisoner's base, and playgroundball.

*Senior High School Choices—Boys.*—In the ninth grade the boys voted for these activities as their first and second choices: self-testing activities; tumbling; hunting plays and games; black and white and black tom; athletic activities or contests; running high jump, passing football, touch football game, dodgeball, volleyball, and wrestling (mass).

All of these activities were rated one by the teachers as to the participation of the boys with the exception of black and white which was rated two.

In the tenth grade the boys voted for these activities as their first and second choices: self-testing activities; tumbling; hunting plays and games; swat the kaiser, and basketball dribble relay; athletic activities or contests; running high jump; hurdles, volleyball, touch football game; passing football game and wrestling (mass).

All these activities were rated one by the teachers as to the participation of the boys, with the exception of swat the kaiser which was rated two.

The activities of those voted first and second choice which the teachers observed the boys of the senior high school play after school voluntarily were: tumbling, basketball dribble relay, hurdles, running high jump, volleyball, dodgeball, passing football, touch football game, and passing football game.

TABLE III

DISTRIBUTION ACCORDING TO GRADES OF ACTIVITIES VOTED FIRST AND SECOND CHOICE BY BOYS OF THE SENIOR HIGH SCHOOL

| Activity | First Choice Grades | Second Choice Grades |
|---|---|---|
| Touch Football Game | 10 | 9 |
| Passing Football | 9 | |
| Passing Football Game | | 10 |
| Tumbling | 9 10 | |
| Dodgeball | | 9 |
| Wrestling (Mass) | 10 | 9 10 |
| Black and White | 9 | 9 |
| Black Tom | | 9 |
| Running High Jump | 9 10 | |
| Hurdles | | 10 |
| Volleyball | 10 | 9 |
| Basketball Dribble Relay | | 10 |
| Swat the Kaiser | | 10 |

The participation of the boys in all first and second choice activities was rated one except for the following which were rated two.

The following were the activities of those voted first and second

TABLE IV

TEACHERS' RATING OF BOYS' PARTICIPATION

| Activity | First Choice Grades | Second Choice Grades |
|---|---|---|
| Black and White | 9 | 9 |
| Swat the Kaiser | | 10 |

choice which the teachers observed boys play voluntarily after school: touch football game, passing football, passing football game, tumbling, dodgeball, running high jump, hurdles, volleyball, basketball dribble relay.

*Junior High School Choices—Girls.*—In the seventh grade the girls voted for these activities as their first and second choices: self-testing (voted for as a group); rhythmical activities; tap dancing; hunting plays and games; find your partner, athletic activities or contests; volleyball, German batball, and goalball; formalized or invented movements; marching.

In the eighth grade the girls voted for these activities as their first and second choices: self-testing (voted for as a group); rhythmical activities; tap dancing; athletic activities or contests; volleyball, tennis, captainball, and dodgeball; formalized or invented movements; marching.

In the ninth grade the girls voted for these activities as their first and second choices: self-testing (voted for as a group); rhythmical activities; tap dancing; hunting plays and games; find your partner; athletic activities or contests; volleyball, tennis; captainball, and dodgeball; formalized or invented movements; marching.

The participation of the girls in all the first and second choice activities was rated by the teachers as one.

The activities of those voted first and second choice which the teachers observed the girls play after school voluntarily were: self-

TABLE V

DISTRIBUTION ACCORDING TO GRADES OF ACTIVITIES VOTED FIRST AND SECOND CHOICE BY GIRLS OF THE JUNIOR HIGH SCHOOLS

| Activity | First Choice Grades | Second Choice Grades |
|---|---|---|
| Volleyball | 7 8 9 | |
| Marching | 7 8 9 | 7 8 9 |
| Tap Dancing | 7 8 9 | |
| German Batball | 7 | 7 |
| Stealing Ammunition | 7 | |
| Goal Ball | | 7 |
| Find Your Partner | | 7 9 |
| Self-testing Activities | | 7 8 9 |
| Tennis | 8 9 | 8 9 |
| Captainball | 8 9 | 8 |
| Dodgeball | 8 | 9 |

testing activities, tap dancing, tennis, volleyball, German batball, captainball, and dodgeball.

*Teachers' Rating of Girls' Participation.*—The participation of the girls in all the first and second choice activities was rated one.

The following were the activities of those voted first and second choice which the teachers observed girls play voluntarily after school: volleyball, tap dancing, German batball, self-testing activities, tennis, captainball, and dodgeball.

*Senior High School Choices—Girls.*—In the ninth grade the girls voted for these activities as their first and second choices: self-testing activities, apparatus; rings and buck; rhythmical activities; clog dancing and Irish jig; hunting plays and games; Indian club relay; athletic activities or contests; dodgeball and playgroundball.

All activities were rated one by the teachers as to the participation of the girls with the exception of Irish jig which was rated two.

In the tenth grade the girls voted for these activities as their first and second choice: self-testing activities, apparatus; ring, buck, and horse; rhythmical activities; clog dancing; hunting plays and games; Indian club relay and ball throw relay; athletic games or contests; playgroundball distance throw, dodgeball, playgroundball, and captainball.

The participation of the girls in all the first and second choice activities was rated one with the exception of the following which were rated two: Indian club relay and ball throw relay.

The activities of those voted first and second choice which the teachers observed the girls play after school voluntarily were: clog dancing, dodgeball, playgroundball, and captainball.

TABLE VI

DISTRIBUTION ACCORDING TO GRADES OF ACTIVITIES VOTED FIRST AND SECOND CHOICE BY GIRLS OF THE SENIOR HIGH SCHOOLS

| Activity | First Choice Grades | | Second Choice Grades | |
|---|---|---|---|---|
| Rings | 9 | | 9 | 10 |
| Buck | 9 | 10 | | |
| Dodgeball | | | 9 | 10 |
| Clog Dancing | 9 | | 9 | 10 |
| Playgroundball | 9 | 10 | | |
| Indian Club Relay | 9 | | 9 | 10 |
| Captainball | | 10 | | |
| Ball Throw Relay | | 10 | | |
| Horse | | 10 | | |
| Irish Jig | | | 9 | |
| Playgroundball Distance Throw | | | | 10 |

*Teachers' Rating of Girls' Participation.*—The participation of the girls in all the first and second choice activities was rated one except for the following, which were rated two.

TABLE VII

TEACHERS' RATING OF PUPILS' PARTICIPATION, SENIOR HIGH SCHOOL GIRLS

| Activity | First Choice Grades | Second Choice Grades |
|---|---|---|
| Irish Jig | | 9 |
| Ball Throw Relay | 10 | |
| Indian Club Relay | | 10 |

The following activities of those voted first and second choice were the activities which the teachers observed girls play voluntarily after school: dodgeball, clog dancing, playgroundball, and captainball.

## DISCUSSION

*Two Factors Which May Have Influenced the Pupils in Their Choices.*—The conditions of physical nature in all schools were not the same, and the voting in those schools having better outdoor conditions seemed to favor the outdoor type of activity.

The unconscious influence of a teacher in the presenting of certain activities more enthusiastically than others may or may not have weighed the balance in certain cases. The skill that some teachers have in particular phases of the program may have influenced the pupils' choice. For example, a physical education teacher who is a "star" in track events will teach those events possibly more forcefully than one who is not; or a graceful and accomplished teacher of dancing will arouse the interest of the girls in rhythmic activities rather than in the athletic part of the program.

*Suggestions as a Result of This Study.*—The following suggestions are offered:

1. That every department of physical education planning to write a course of study give full consideration to the reaction of the pupils to the elements of the program.

2. That every new activity presented to the pupils, after a suitable time has elapsed, be voted upon by the pupils.

3. That discussion periods be set up to analyse the "whys and wherefores" of the votes—the pupils handling the whole situation themselves.

4. That the reasons for or against the activity be recorded by the teacher and presented at a department meeting for the benefit of the other teachers.

5. That pupils be encouraged to create games and other activities so that as soon as these prove popular with the group they can be incorporated in the course of study.

It may be that the gymnasium and playground will become a laboratory of play, losing any atmosphere of militarization which may now exist. With the steps, participation, satisfaction, and repetition in the

minds of the leaders, the pupils may evolve in time, under guidance, their own play program. At any rate, through having a part in the making of the program, the carry-over of the activities of the daily routine into the after-school life may be established. With this participation will come growth and creative experience. Such records as the teachers may keep of this growing will be of great value to those who hope to fit the program in physical education to the child's present and future needs. The first step in the plan of pupil participation in program making has been carried out in this study, since the appeal to the pupils in regard to their interest in certain activities was a direct one. Their choices will be considered of paramount importance in the making of a course of study. It is the hope of the Physical Education Department of the Public Schools of Norfolk, Virginia, that this study will also prove of value to others in the field of physical education.

# A Health Knowledge Test

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THE QUESTION of personal health as a whole probably belongs in the qualitative world. In the study of many qualitative phenomena, the use of the scientific method frequently seeks quantitative data. The modern interpretation of the word health is so broad that many specific health questions are amenable to exact measurement and study by statistical methods. Other questions of health, however, are so largely subjective that their quantitative study can, at best, have only indirect or implied validity.

The recent tendencies to discredit the value of promoting health knowledge per se, has had wholesome effects. The emphasis upon health practice, which was first started at the primary school level, is of course most desirable. One wonders whether or not the emphasis upon practice may not have gone too far in discrediting the value of health information upon which intelligent practice often depends. Perhaps this is not so to a serious extent, in view of the entrenched emphasis upon subject matter in our schools.

Whatever the relative value of health information may be in desirable health outcomes, we certainly cannot ignore it in our program of school child or adult health work. Fortunately also information is fairly subject to quantitative, paper-and-pencil evaluation. In this, as in any other field of quantitative study, standards or units of measurement are of course necessary. Whatever value may be placed upon it, health information has very few recognized standards of achievement. The teaching of any other subject would also be confusing, uncertain, and more or less out of caste if there were no recognized rungs in the ladder of its learning.

Like other phases of school health work, tests of health knowledge have so far been most satisfactorily developed for the lower grade levels. Anything like standards of knowledge at other age levels have not been developed.

IN RESPONSE to a particular request members of the Division of Hygiene and Public Health of the University of Michigan started last year to determine the health knowledge of college students. Knowledge of tuberculosis was first sought but this soon expanded to include other phases of health information. After a survey of sources of material

and technics of measurement, a preliminary test was formulated much as given herewith. It was tried on several groups and variously subjected to criticism and correction.

The formulation of a test of health information for any particular level of higher education encounters so much uncertainty and variability that this test was considered as for the general level of informed adults. With a single test at the adult level it is suggested that variations of groups may be provided for by different levels of scores to be expected. Perhaps the score of selected high school graduates, entering college freshmen, is a good base line of reference in judging the knowledge of other groups. In this test that group averaged 39 per cent. This indicates plenty of room in this test to provide for improvement as a result of college instruction in hygiene.

In its present tentative form the test was given to 1,045 freshmen men last fall before they had received any health instruction. The test has been given also to several other smaller groups of students for which the average scores are given in Tabulations Series Two.

Among the problems of scoring such tests is that of correcting for chance in the true-false type. The method of subtracting the wrong from the correct, ignoring the unanswered, seems to be favored. The answer distributions show that in this test the difference method gives results much more like the results of the multiple choice and the completion types than the method of using the total correct true-false answers. It was therefore used in determining the total scores in this series, which are given as actual correct in the total of 143 questions, and as percentages of that number.

The scores on individual questions offer a basis for the determination of their suitability for the persons tested. They offer also many other possibilities of study for one who has experience in such test studies. In the order of combined and averaged scores by subjects one is rather surprised that the questions related to mental hygiene are highest and that sex answers rate lowest. The analysis of total score averages for the true-false questions gives of course a lower figure when the wrong answers are deducted from the total correct, but the distribution of such scores shows good graphic conformity to the scores of the multiple choice and completion questions.

FOR whatever use or interest they may serve, the following data are submitted. Suggestions, criticisms, and results of experience of any nature will be most welcome. What may be done here in the further development of this or other tests is not now planned.

May we repeat the judgment that a plan to develop a single test adjusted to pass the average well informed adult at a score of about 75 per cent would be wiser now than efforts at developing a test for college students primarily. For the present at least such a standardized

test should serve the needs of the college situation in particular and in addition relate the student to the desirably informed citizen.

## THE TEST, CORRECT ANSWERS, AND ANALYSES
## TABULATION SERIES ONE

FRESHMEN MEN (1,046 AT ENTRANCE) FALL, 1934
(T, True; F, False; U, Unanswered)

*Part I—True False*

| *Question No.* | | *Answers Number* T | F | * U |
|---|---|---|---|---|
| 1. | Possible use in later life is a good criterion for the selection of sports in which to become interested in college. (T correct) | 641 | 392 | 13 |
| 2. | Behavior based upon emotions is essentially unselfish and social. (F correct) | 195 | 835 | 16 |
| 3. | It is unimportant that industry take precautions to protect workers from chemical poisons. (F correct) | 103 | 940 | 1 |
| 4. | Deep breathing exercises taken voluntarily in front of an open window standing still are of no health value. (T correct) | 99 | 948 | 1 |
| 5. | The essential health reason for wearing clothing is to promote body heat regulation. (T correct) | 774 | 265 | 7 |
| 6. | Lack of emotional control is basic in many health and social problems. (T correct) | 923 | 110 | 11 |
| 7. | The accumulation of carbon dioxide in unventilated living rooms is a menace to health. (F correct) | 904 | 142 | 2 |
| 8. | Prenatal diet of the mother is an important factor in preventing decayed teeth of a child. (T correct) | 850 | 182 | 14 |
| 9. | The proper humidity of living room air is about one-half saturation with moisture. (T correct) | 378 | 630 | 38 |
| 10. | It is generally more beneficial to take regular graded exercises for separate parts of the body than to get exercise by playing games. (F correct) | 425 | 616 | 6 |
| 11. | The presence of devitalized (dead) teeth in the mouth is an unimportant health hazard. (F correct) | 49 | 994 | 3 |
| 12. | Emotions are natural to human beings. (T correct) | 1024 | 19 | 2 |
| 13. | Proper knowledge of the lungs with relation to tuberculosis cannot be obtained without an X-ray examination. (T correct) | 653 | 377 | 17 |
| 14. | Physical exercises requiring coordination of smaller muscle groups are best for young children. (F correct) | 696 | 325 | 23 |
| 15. | Undesirable behavior based upon emotional factors is possible of control by reason. (T correct) | 865 | 145 | 38 |
| 16. | Vaccination against smallpox is a form of passive immunity. (F correct) | 652 | 361 | 31 |
| 17. | The depletion of oxygen from rebreathing air in closed living rooms injures one's health. (F correct) | 895 | 145 | 6 |
| 18. | One is a true adult in the degree to which he has socialized his ego. (T correct) | 610 | 399 | 42 |
| 19. | Man is subject to a high degree of parasitism. (T correct) | 669 | 312 | 59 |

* Note that the percentage is about one-tenth of the number.

| *Question No.* | | *Answers Number* T | F | U |
|---|---|---|---|---|
| 20. | Milk contains practically all of the essentials of a complete diet and is the most nearly perfect food. (T correct) | 947 | 90 | 9 |
| 21. | The most important cause of mechanical injuries to our people is fire. (F correct) | 198 | 821 | 27 |
| 22. | The state of mind can be depended upon to insure one against the hazards of sickness and disease. (F correct) | 216 | 821 | 9 |
| 23. | A chiropractor has had ample training to be able to handle problems of human illness. (F correct) | 108 | 926 | 13 |
| 24. | The physiological effect of alcohol is a stimulant. (F correct) | 630 | 400 | 15 |
| 25. | Knowledge of sex questions is harmful. (F correct) | 36 | 1005 | 6 |
| 26. | Testimonials for advertised medicines have been known to appear in newspapers for months after the death of the person who signed the testimonial. (T correct) | 828 | 139 | 77 |
| 27. | Comparatively few drugs are known to be really worth while in the treatment of diseases. (T correct) | 544 | 496 | 8 |
| 28. | Homesickness is a sign that the person has not made the proper transfer from dependence to independence. (T correct) | 762 | 273 | 10 |
| 29. | Fat people are unable to burn carbohydrates normally. (F correct) | 705 | 303 | 38 |
| 30. | The phenomenon of human infection as a cause of disease is biologically comparable to the "scale" on a plant, a louse on a bird, or a worm on a dog. (T correct) | 564 | 430 | 53 |
| 31. | Body weight is determined by the total caloric value of food taken in relation to the amount of muscular exercise. (T correct) | 524 | 459 | 62 |
| 32. | The natural drives of man are sufficient to insure the development of a child into the desirable type of citizen in our society. (F correct) | 288 | 694 | 64 |
| 33. | Breast feeding of infants is superior to bottle feeding. (T correct) | 933 | 89 | 23 |
| 34. | Meat foods do not need to be cooked so far as health protection is concerned. (F correct) | 121 | 911 | 14 |
| 35. | Human beings are the reservoirs of most disease producing organisms. (T correct) | 611 | 392 | 42 |
| 36. | Patent medicines are sold primarily for the benefit of the people who purchase them. (F correct) | 127 | 911 | 7 |
| 37. | Green leafy vegetables are important foods because of the calories contained. (F correct) | 403 | 627 | 18 |
| 38. | Nervous breakdown is understood to be caused by organic defects of the nerves. (F correct) | 511 | 484 | 49 |
| 39. | Alcohol injures the liver. (T correct) | 749 | 251 | 46 |
| 40. | The incubation period of a contagious disease is from its height to recovery. (F correct) | 178 | 804 | 64 |
| 41. | A practical method is known by which tuberculosis can be eliminated from our population. (T correct) | 342 | 676 | 28 |

| *Question No.* | | *Answers Number* T | F | U |
|---|---|---|---|---|
| 42. | Our present birth rate exceeds our death rate. (T correct) | 796 | 224 | 27 |
| 43. | Insanity was explained upon the basis of supernaturalism almost exclusively until the last century. (T correct) | 822 | 161 | 61 |
| 44. | Body rest is a most important factor in recovery from colds, tuberculosis, and fever. (T correct) | 960 | 82 | 5 |
| 45. | Goiter is a disease caused by a mineral deficiency of the diet. (T correct) | 774 | 234 | 38 |
| 46. | Disease germs are commonly transmitted by air. (F correct) | 765 | 271 | 12 |
| 47. | Diabetes is very much on the decrease. (F correct) | 547 | 434 | 63 |
| 48. | A "work out" is the best way to cure a cold. (F correct) | 211 | 807 | 28 |
| 49. | There is no strictly hereditary disease. (F correct) | 245 | 779 | 22 |
| 50. | Aside from mechanical injury, industries present no serious health hazards to workers. (F correct) | 59 | 981 | 5 |
| 51. | Mental hygiene problems are mainly caused by heredity. (F correct) | 417 | 589 | 40 |
| 52. | A large proportion of insanity results from mental conflict. (T correct) | 798 | 208 | 41 |
| 53. | The present death rate per 1,000 population is about 50 annually. (F correct) | 414 | 443 | 188 |
| 54. | The problem of fatigue is a simple and well understood question. (F correct) | 407 | 602 | 35 |
| 55. | Caution in mate selection is important for the health of the next generation. (T correct) | 1020 | 15 | 11 |
| 56. | As a general policy schools should be closed when contagious diseases appear. (F correct) | 851 | 193 | 5 |
| 57. | Heart disease is the present leading cause of death for combined ages. (T correct) | 706 | 299 | 41 |
| 58. | Problems of health and disease are still mixed up with supernaturalism and religion. (T correct) | 635 | 398 | 13 |
| 59. | It is proper to define fatigue as "an inability to do work as a result of having done work." (T correct) | 381 | 645 | 21 |
| 60. | If a pandemic of influenza like that of 1918 were known to be returning next fall, we would be in no better position to handle it than when we had no such warning. (T correct) | 128 | 908 | 9 |
| 61. | Tuberculosis germs are spread by mosquitoes. (F correct) | 52 | 980 | 14 |
| 62. | Taking coffee is a healthful way of relieving fatigue. (F correct) | 86 | 952 | 9 |
| 63. | Pasteurization renders milk safe by removing cow manure, hair, and other dirt. (F correct) | 135 | 905 | 5 |
| 64. | Ability of the general public to secure and pay for good medical care was not a particular problem during the prosperous years of about 1928. (F correct) | 606 | 419 | 21 |
| 65. | Recovery from tuberculosis is facilitated by the use of drugs. (F correct) | 47 | 984 | 16 |

| *Question No.* | | *Answers Number* T | F | U |
|---|---|---|---|---|
| 66. | Protein sensitization is an important cause of other illnesses than hay-fever. (T correct) | 576 | 317 | 153 |
| 67. | Poor posture is not an important cause of poor health. (T correct) | 148 | 893 | 4 |
| 68. | City people are more susceptible to contagious diseases than country people. (F correct) | 751 | 287 | 8 |
| 69. | Over one-half of the population of the world would be relieved of an important disease by wearing shoes. (T correct) | 511 | 461 | 74 |
| 70. | The periodic health examination has not been demonstrated to be a worth-while and practical procedure in health work. (F correct) | 86 | 949 | 11 |
| 71. | Malaria is transmitted by bed bugs. (F correct) | 41 | 994 | 12 |
| 72. | The chance of recovery from tuberculosis of the lungs is not good even when recognized very early. (F correct) | 183 | 854 | 8 |
| 73. | Cancer is one of the diseases which has been reduced in frequency. (F correct) | 413 | 618 | 15 |
| 74. | Eight to ten hours of sleep regularly is an important question for the health of a college student. (T correct) | 991 | 52 | 4 |
| 75. | Appendicitis is understood to be caused by a disturbance of a gland of internal secretion. (F correct) | 469 | 518 | 58 |
| 76. | It is approximately correct to say that human behavior is 80% based upon emotions and 20% upon reason. (T correct) | 726 | 286 | 32 |
| 77. | A person with a strong healthy body need not be vaccinated for protection against smallpox or typhoid fever. (F correct) | 18 | 1022 | 6 |
| 78. | There is no health value in frequent handwashing. (F correct) | 9 | 1035 | 2 |
| 79. | One cannot determine the safety of drinking water by its appearance, taste, or odor. (T correct) | 953 | 81 | 3 |

*Part II—Multiple Choice*

| *Question No.* | | *Answers Number* |
|---|---|---|
| 1. | Goiter is not so prevalent in Michigan now because | |
| | the doctors have removed them | 16 |
| | of climatic changes | 48 |
| | of iodized table salt (correct) | 878 |
| | they are not recognized | 5 |
| | more tonsils are removed | 84 |
| | unanswered | 18 |
| 2. | For artificial respiration the patient should be lying | |
| | face up | 104 |
| | face down (correct) | 852 |
| | on left side | 29 |
| | on right side | 25 |
| | alternately face up and down | 26 |
| | unanswered | 11 |

| *Question No.* | | *Answers Number* |
|---|---|---|
| 3. | Tuberculosis is primarily | |
| | a disease of nutrition | 283 |
| | an infection (correct) | 498 |
| | an injury | 5 |
| | a hereditary disease | 242 |
| | an emotional disturbance | 1 |
| | unanswered | 18 |
| 4. | Vitamin C is found in | |
| | maple syrup | 7 |
| | wholewheat bread | 353 |
| | tomatoes (correct) | 445 |
| | cane sugar | 50 |
| | roast beef | 51 |
| | unanswered | 140 |
| 5. | Scurvy is prevented by vitamin | |
| | A | 233 |
| | B | 152 |
| | C (correct) | 156 |
| | D | 304 |
| | E | 42 |
| | unanswered | 164 |
| 6. | Oleomargerine as compared with butter lacks | |
| | calories | 321 |
| | freedom from disease germs | 6 |
| | freedom from poison | 12 |
| | vitamins (correct) | 574 |
| | proper color | 89 |
| | unanswered | 46 |
| 7. | The proper first aid treatment of a finger cut is | |
| | sucking | 36 |
| | putting peroxide on it | 505 |
| | letting it bleed some, then elevating and allowing it to seal up in the blood clot (correct) | 429 |
| | washing it off with tap water | 44 |
| | covering it with court plaster moistened with saliva | 14 |
| | unanswered | 20 |
| 8. | "Athlete's heart" means | |
| | an enlarged heart | 678 |
| | a damaged heart | 142 |
| | a small heart | 14 |
| | a supposed injury to the heart which no one has been able to demonstrate (correct) | 143 |
| | unanswered | 69 |
| 9. | Drops are put into the eyes in testing for glasses primarily to | |
| | keep the eyes from crossing | 2 |
| | make the pupils large | 479 |
| | relax the muscles of accommodation (correct) | 455 |
| | change the shape of the cornea | 24 |
| | aid the patient in getting used to glasses | 34 |
| | unanswered | 53 |

| *Question No.* | | *Answers Number* |
|---|---|---|
| 10. | It is an almost certain sign of tuberculosis to | |
| | have a cough | 131 |
| | have an unusual thirst | 25 |
| | cough up some blood (correct) | 790 |
| | have pain in abdomen | 21 |
| | lose one's appetite | 39 |
| | unanswered | 41 |
| 11. | The proper first aid for a turned ankle is | |
| | walking on it | 35 |
| | manipulating it | 110 |
| | complete rest and elevation (correct) | 558 |
| | rubbing it with liniment | 299 |
| | painting it with iodine | 33 |
| | unanswered | 18 |
| 12. | Masturbation of itself | |
| | tends to produce insanity | 245 |
| | results in delinquency | 320 |
| | is an infantile habit of no serious physical consequence (correct) | 286 |
| | shows in one's expression | 30 |
| | produces pimples | 44 |
| | unanswered | 122 |
| 13. | A pound of lean meat furnishes more calories than | |
| | a pound of butter | 38 |
| | a quart of oil | 206 |
| | a pound of lard | 242 |
| | a pound of spinach (correct) | 443 |
| | a quart of cream | 38 |
| | unanswered | 79 |
| 14. | During menstruation, in general, women should | |
| | go to bed | 48 |
| | reduce usual activities | 698 |
| | carry on as usual (correct) | 72 |
| | take medicine | 7 |
| | give up all bathing | 145 |
| | unanswered | 78 |
| 15. | Excessively dry air causes waste of fuel because | |
| | coal burns faster | 84 |
| | the excessive evaporation of the skin makes one feel cold and demands more fire (correct) | 683 |
| | heat does not circulate as well | 148 |
| | clothing does not retain body heat | 66 |
| | objects feel colder | 13 |
| | unanswered | 54 |
| 16. | One should regret having devital teeth, particularly because they may | |
| | get loose | 10 |
| | get dark | 9 |
| | cause pyorrhea | 205 |
| | become an unrecognized source of generalized infection (correct) | 758 |
| | look bad | 8 |
| | unanswered | 54 |

| *Question No.* | | *Answers Number* |
|---|---|---|
| 17. | Seminal emissions in the male are | |
| | normal (correct) | 690 |
| | produced by posture in bed | 31 |
| | sign of disease | 50 |
| | harmful | 57 |
| | caused by excessive protein diet | 77 |
| | unanswered | 146 |
| 18. | The World War draft examination of our young men showed them to be unfit for military service to the extent of about | |
| | 10 per cent | 172 |
| | 25 per cent | 261 |
| | 35 per cent (correct) | 245 |
| | 50 per cent | 117 |
| | 75 per cent | 74 |
| | unanswered | 174 |
| 19. | Tuberculosis has been very much reduced by tuberculin testing of | |
| | sheep | 68 |
| | beef cattle | 120 |
| | chickens | 11 |
| | milk cows (correct) | 789 |
| | house pets | 29 |
| | unanswered | 29 |
| 20. | Spinach is especially rich in | |
| | iron (correct) | 926 |
| | fat | 1 |
| | sugar | 1 |
| | starch | 10 |
| | protein | 94 |
| | unanswered | 14 |
| 21. | The instrument used for testing hearing acuity is called a (an) | |
| | manometer | 6 |
| | stethoscope | 118 |
| | speculum | 10 |
| | audiometer (correct) | 804 |
| | ophthalmoscope | 55 |
| | unanswered | 53 |
| 22. | Tuberculosis is most frequent in | |
| | men under 18 years of age | 145 |
| | women under 18 years of age | 120 |
| | men 18 to 40 years of age | 356 |
| | women 18 to 40 years of age (correct) | 207 |
| | men over 40 years of age | 106 |
| | unanswered | 119 |
| 23. | The best form of political organization for the administration of local public health is | |
| | township | 223 |
| | county (correct) | 228 |
| | state | 165 |
| | federal | 141 |
| | ward | 249 |
| | unanswered | 45 |

| *Question No.* | | *Answers Number* |
|---|---|---|
| 24. | Gonorrhea is a frequent cause of | |
| | brain disease | 124 |
| | sterility (correct) | 404 |
| | insanity | 173 |
| | paralysis | 93 |
| | diabetes | 53 |
| | unanswered | 198 |
| 25. | Blindness of the new born baby is most frequently caused by | |
| | syphilis | 580 |
| | chancroid | 56 |
| | nephritis | 63 |
| | gonorrhea (correct) | 127 |
| | diabetes | 7 |
| | unanswered | 216 |
| 26. | Death rates are lowest for age groups of | |
| | under 1 year | 63 |
| | preschool age | 93 |
| | school age (correct) | 328 |
| | young adults | 470 |
| | adults | 42 |
| | unanswered | 47 |
| 27. | Oxygen from the air is carried to the body tissue by | |
| | white blood cells | 152 |
| | the lymph | 63 |
| | red blood (correct) | 723 |
| | carbohydrates | 27 |
| | epithelial cells | 29 |
| | unanswered | 56 |
| 28. | The pituitary gland is situated | |
| | behind the thyroid gland | 173 |
| | near the pancreas | 103 |
| | above the kidney | 74 |
| | in the pelvis | 82 |
| | at the base of the brain (correct) | 362 |
| | unanswered | 248 |
| 29. | The normal function of perspiration is to | |
| | cleanse the skin | 28 |
| | oil the skin | 3 |
| | get rid of water | 35 |
| | eliminate poisons | 557 |
| | regulate body heat (correct) | 407 |
| | unanswered | 20 |
| 30. | As a public health measure, protection against measles is especially important in the age group | |
| | after 50 years | 8 |
| | 10-15 years | 69 |
| | under 5 years (correct) | 363 |
| | 5 to 10 years | 563 |
| | 15 to 30 years | 22 |
| | unanswered | 25 |

| *Question No.* | | *Answers Number* |
|---|---|---|
| 31. | In addition to avoiding contact with open cases, the prevention of active tuberculosis depends upon | |
| | a particular serum treatment | 25 |
| | taking certain medicine | 3 |
| | general hygienic living (correct) | 885 |
| | tuberculin injections | 88 |
| | reduced protein diet | 17 |
| | unanswered | 28 |
| 32. | The most certain way to recover from a cold is to | |
| | take a cathartic | 129 |
| | take a good "work out" | 161 |
| | go to bed (correct) | 619 |
| | cut down on food | 24 |
| | gargle the throat | 91 |
| | unanswered | 27 |
| 33. | Pasteur was the | |
| | inventor of the X-ray | 17 |
| | first person to do vaccination | 208 |
| | father of medicine | 16 |
| | father of bacteriology (correct) | 769 |
| | discoverer of insulin | 17 |
| | unanswered | 21 |
| 34. | The most important factor in recovery from tuberculosis is | |
| | climate | 503 |
| | rest (correct) | 443 |
| | deep breathing | 44 |
| | exercise | 22 |
| | injections of tuberculin | 10 |
| | unanswered | 29 |
| 35. | True heredity is understood to account for | |
| | syphilis | 414 |
| | tuberculosis | 259 |
| | color blindness (correct) | 209 |
| | smallpox | 4 |
| | spinal curvature | 63 |
| | unanswered | 98 |
| 36. | Measles is most contagious during the time of | |
| | before the rash appears (correct) | 340 |
| | when the rash is at its height | 297 |
| | when the skin is peeling | 276 |
| | after the skin has peeled | 7 |
| | as the rash fades | 46 |
| | unanswered | 79 |
| 37. | Edward Jenner discovered | |
| | the malaria parasite | 198 |
| | the Schick test | 140 |
| | vaccination (correct) | 318 |
| | bacteria | 47 |
| | spermatozoa | 67 |
| | unanswered | 277 |

38. In order to gain weight a college student should eat about
    - 500 calories of food daily ... 26
    - 1500 calories of food daily ... 175
    - 3500 calories of food daily (correct) ... 498
    - 10,000 calories of food daily ... 119
    - 40,000 calories of food daily ... 65
    - unanswered ... 162

39. The best treatment for an infection (beginning boil) on the skin
    - squeeze it ... 14
    - apply peroxide ... 206
    - open with a needle ... 85
    - cut it open ... 26
    - let it alone (correct) ... 692
    - unanswered ... 25

40. Mental health depends, above all else, upon the
    - facing reality (correct) ... 581
    - a great deal of introspection or self-analysis ... 332
    - refusing to face unpleasant situations ... 24
    - learning hard tasks ... 75
    - day dreaming ... 6
    - unanswered ... 28

41. Immunity to diphtheria is tested by
    - a culture of the nose and throat ... 89
    - a blood cell count ... 55
    - the Mantoux test ... 34
    - an injection of toxin into the skin (correct) ... 532
    - the Dick test ... 239
    - unanswered ... 99

42. To stop bleeding in common cuts the first thing to do is
    - put on a tourniquet ... 158
    - elevate the part (correct) ... 405
    - put on cold water ... 304
    - put on iodine ... 154
    - cause movement of the cut edges ... 5
    - unanswered ... 21

43. In case a person is bitten by a dog the most important thing to do first is
    - dress the wound ... 171
    - go call the police ... 18
    - go call a doctor ... 476
    - kill the dog ... 26
    - follow the dog and confine it for observation (correct) ... 336
    - unanswered ... 23

44. When a person feels faint he should
    - go for fresh air ... 533
    - go for some water to drink ... 59
    - lower his head (correct) ... 386
    - hold his breath ... 4
    - massage his temples ... 47
    - unanswered ... 16

45. Habitual constipation should not be treated by
    - diet ..... 80
    - increased exercise ..... 72
    - regular habits ..... 76
    - reassurance ..... 65
    - cathartics (correct) ..... 728
    - unanswered ..... 28

46. A positive tuberculin (Mantoux) test means
    - active tuberculous disease is certain..... 244
    - active disease is or has been present (correct)..... 283
    - immunity to the disease..... 210
    - disease was or is in lungs only..... 58
    - no further attention is needed..... 66
    - unanswered ..... 183

*Part III. Completion*

*a*) The (1) (*carbon monoxide*) in automobile gas is a (2) (*poison*). (1) correct 771, incorrect 143, blank 132. (2) correct 786, incorrect 92, blank 170.

*b*) Infant blindness is prevented by dropping (3) (*silver nitrate*) into the eyes of all babies (4) *immediately* after birth. (3) correct 128, incorrect 217, blank 698. (4) correct 429, incorrect 83, blank 534.

*c*) We know that measles is spread from the sick child to another child by discharge from the (5) (*nose*) and (6) (*throat*). (5) correct 455, incorrect 215, blank 376. (6) correct 466, incorrect 163, blank 416.

*d*) The average length of life during the Middle Ages was about (7) (*25*) years as compared with (8) (*60*) years now. (7) correct 141, incorrect 756, blank 149. (8) correct 373, incorrect 545, blank 128.

*e*) The brain is part of the (9) (*nervous*) system of the body. (9) correct 836, incorrect 92, blank 118.

*f*) Pasteurization of milk is accomplished by heating it to (10) (*140-150*) degrees Fahrenheit for a period of (11) (*30*) minutes. (10) correct 108, incorrect 706, blank 231. (11) correct 217, incorrect 554, blank 275.

*g*) Many cities secure a good drinking water supply from muddy sluggish streams by (12) (*filtration*) and the addition of (13) (*chlorination*) to it. (12) correct 741, incorrect 186, blank 119. (13) correct 723, incorrect 193, blank 132.

*h*) Infantile paralysis is believed to be spread by contact with the (14) (*nasal*) discharge of infected individuals. (14) correct 148, incorrect 311, blank 583.

*i*) Chancre is the (15) (*first*) stage of (16) (*syphilis*). (15) correct 196, incorrect 148, blank 701. (16) correct 124, incorrect 181, blank 744.

*j*) The tuberculosis death rate for (17) (*all*) ages is on the (18) (*decrease*). (17) correct 295, incorrect 226, blank 523. (18) correct 491, incorrect 50, blank 505.

*k*) A balanced diet, stated in scientific terms, should include (19) (*protein*), (20) (*carbohydrates*), (21) (*fats*), (22) (*vitamins*), (23) (*minerals*). (19) correct 610, incorrect 189, blank 248. (20) correct 500, incorrect 284, blank 263. (21) correct 395, incorrect 293, blank 353. (22) correct 449, incorrect 263, blank 334. (23) correct 229, incorrect 368, blank 449.

*l*) Every case of suspected chicken pox should be diagnosed by a (24) (*physician*) because it may be confused with (25) (*smallpox*). (24) correct 892, incorrect 36, blank 118. (25) correct 523, incorrect 309, blank 216.

*m*) The general causes of death for all ages are headed by (26) (*heart*) disease. (26) correct 700, incorrect 140, blank 206.

*n*) Frequent general baths are desirable when pupils are crowded in one classroom because of (27) (*odors*). (27) correct 193, incorrect 609, blank 240.

*o*) Bubonic plague is spread by the bites of (28) (*fleas*) which get the germs from (29) (*rats*). (28) correct 150, incorrect 516, blank 381. (29) correct 158, incorrect 378, blank 511.

*p*) The germ which causes the common cold is (30) (*unknown*) which makes the prevention of this condition (31) (*difficult*). (30) correct 229, incorrect 139, blank 676. (31) correct 208, incorrect 238, blank 602.

*q*) A common blood disease is called (32) (*anaemia*) and is characterized by a deficiency of (33) (*hemoglobin*) in the blood. (32) correct 350, incorrect 183, blank 512. (33) correct 275, incorrect 306, blank 464.

*r*) Sewage spreads disease generally by getting into (34) (*drinking water*). (34) correct 787, incorrect 109, blank 149.

*Answer Counts*

| Part I. Answer Count. | Correct minus wrong. *Answer* | Part I. Answer Count. | Total correct. *Answer* |
|---|---|---|---|
| 0 — 8 | 28 | 0 — 8 | 1 |
| 9 — 17 | 132 | 9 — 17 | 2 |
| 18 — 26 | 309 | 18 — 26 | 9 |
| 27 — 35 | 362 | 27 — 35 | 15 |
| 36 — 44 | 168 | 36 — 44 | 82 |
| 45 — 53 | 45 | 45 — 53 | 509 |
| 54 — 62 | 3 | 54 — 62 | 409 |
| 63 — 71 | 0 | 63 — 71 | 17 |
| 72 — 79 | 1 | 72 — 79 | 1 |

| Part II. Answer Count | Total correct | Part III. Answer Count | (Max. 1 for each question) |
|---|---|---|---|
| 0 — 5 | 3 | | |
| 6 — 10 | 8 | 0 — 2½ | 57 |
| 11 — 15 | 82 | 3 — 5½ | 204 |
| 16 — 20 | 322 | 6 — 8½ | 414 |
| 21 — 25 | 412 | 9 — 11½ | 292 |
| 26 — 30 | 177 | 12 — 14½ | 59 |
| 31 — 35 | 38 | 15 — 18 | 17 |
| 36 — 40 | 4 | | |
| 41 — 46 | 0 | | |

| Total score— *actual* | (Part I. Correct minus wrong) | Percentage Total Score | *Actual* ÷ 143 |
|---|---|---|---|
| 0 — 15 | 3 | 0 — 10 | 3 |
| 16 — 30 | 30 | 11 — 20 | 28 |
| 31 — 45 | 198 | 21 — 30 | 165 |
| 46 — 60 | 403 | 31 — 40 | 345 |
| 61 — 75 | 316 | 41 — 50 | 376 |
| 76 — 90 | 87 | 51 — 60 | 111 |
| 91 — 105 | 9 | 61 — 70 | 17 |
| 106 — 120 | 0 | 71 — 80 | 1 |
| 121 — 135 | 0 | 81 — 90 | 0 |
| 136 — 150 | 0 | 91 — 100 | 0 |

*Analyses*

I. Answers by subject. Answers were grouped and counted by subjects as they concerned topics listed, in order of rank.

| *Number of questions averaged* | *Subject* | *Percentages correct* | *incorrect* | *unanswered* |
|---|---|---|---|---|
| 14 | Mental Hygiene | 72 | 25 | 3 |
| 20 | Miscellaneous other | 67 | 29 | 4 |
| 13 | Medical care, quackery, self-treatment, etc. | 65 | 32 | 3 |
| 14 | Tuberculosis | 61 | 35 | 4 |
| 20 | Nutrition and diet | 57 | 31 | 12 |
| 9 | Physical exercise and rest | 54 | 44 | 2 |
| 28 | Communicable diseases and infections | 50 | 34 | 16 |
| 15 | Public health in general | 47 | 33 | 20 |
| 6 | Anatomy and physiology | 47 | 30 | 23 |
| 6 | First aid | 47 | 51 | 2 |
| 13 | Health statistics | 45 | 41 | 14 |
| 8 | Sex | 35 | 39 | 26 |
| | Average | 54 | 35 | 10 |

II. Scores and Counts. The distributions of answer counts are summarized by the following:

*A. Averages (Approximate Means)*

| | *Number* | *Percentage* |
|---|---|---|
| Part I.—True false | | |
| Correct answers ..... | 47.6 | 60. |
| Score—(correct minus wrong)..... | 28.2 | 36. |
| Part II.—Multiple Choice | | |
| Correct answers ..... | 21.4 | 46. |
| Part III.—Completion | | |
| Correct answers ..... | 7.9 | 44. |
| Total Score—(Correct minus wrong for Part I) | 56. | 39. |

*B. Frequency Distributions*

The distribution of answer counts shows similar graphic relationships, but none not indicated roughly by the numbers given.

## TABULATIONS SERIES TWO

I. Other Michigan Groups—Average Comparable Scores

| *Number tested* | *Group* | *Score Percentage Range* | *Average* |
|---|---|---|---|
| 268 | Upper classes in psychology..... | 11 — 83 | 42 |
| 43 | College group at beginning of course in general hygiene..... | 16 — 83 | 44 |
| 40 | College group at end of course in general hygiene (Same as above)..... | 39 — 89 | 58 |
| 64 | Upperclasses in sociology..... | 30 — 72 | 48 |
| 79 | Seniors in School of Education..... | 29 — 69 | 50 |
| 20 | Physical education majors as beginning seniors ..... | 30 — 70 | 52 |
| 56 | Freshmen women end of year—Had six health lectures..... | 37 — 72 | 53 |

| | | | |
|---|---|---|---|
| 58 | Physical education majors—mixed classes Had previous course in Hygiene | 20 — 76 | 56 |
| 63 | Dental students at end of a course in hygiene and public health..... | 39 — 82 | 60 |
| 30 | Summer school students entering a course in school hygiene..... | 37 — 80 | 60 |
| 96 | Sophomore medical students previous to health courses in medical school..... | 43 — 77 | 62 |
| 33 | Graduate nurses in public health nursing course ..... | 22 — 87 | 63 |
| II. 161 | University of Illinois freshmen men before instruction ..... | 22 — 63 | 39 |

# A Comparison of the Patellar Tendon Reflex Time of Whites and Negroes

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THE PRESENT investigation was undertaken in order to determine whether or not the negro possesses neuro-muscular characteristics which could account for his outstanding performance in certain sport events, especially the sprints. That such a condition might exist is strongly suggested by the fact that at the present time some of the most outstanding sprinters are negroes. If one were to solve this problem completely, it would be necessary to investigate many of the neuro-muscular responses of both negroes and whites so that they might be compared. However, in this investigation, only one neuro-muscular response was studied, viz., the patellar tendon reflex. This response was selected because it has been shown that fast sprinters possess a short reflex time.

## REVIEW OF LITERATURE

A survey of the literature revealed no data relative to the patellar tendon reflex time of negroes. However, several studies have been reported where white subjects were used.

Tuttle, Travis, and Hunter[1] investigated the patellar tendon reflex time of 8 subjects and found the mean to be .0796 sec., with a range of .0557 to .1094 secs. Slinker[2] studied the patellar tendon reflex time of 124 men and 26 women. The mean time was found to be .120 ± .0015 sec. for men and .1108 ± .0023 sec. for women. The range was .076 to .189 sec. for men and .083 to .146 sec. for women. Slinker concludes from his study that the weight of the individual has nothing to do with the reflex time, but that the factor of the age must be considered. Also, fatigue influences the length of the patellar tendon reflex time, since the afternoon readings are longer than the forenoon readings. Tuttle and Lautenbach[3] investigated the relation between reflex time and speed in sprinting. The subjects used in this study were grouped ac-

[1] W. W. Tuttle, L. E. Travis, and Theodore A. Hunter, "Study of the Reflex Time of the Knee-jerk," *Am. J. Physiol.*, 82 (1927), 99-105.

[2] Philip D. Slinker, A Study of the Latent Period of the Knee-jerk with Special Reference to Factors Influencing It Which Are of Interest to Athletic Coaches. 1932, M.A. Thesis. State University of Iowa Library (Unpublished).

[3] W. W. Tuttle and Ruth Lautenbach, "The Relationship Between Reflex Time and Running Events in Track," Research Quarterly, III:3 (Oct., 1932), 138-143.

cording to the type of race which was their specialty. The groups and the mean reflex times reported were as follows:

| *Groups* | *Patellar Tendon Reflex Time* |
|---|---|
| Champions (short distance) | .1008 sec. |
| Short-Distance Group | .0965 sec. |
| Middle-Distance Group | .1221 sec. |
| Distance Group | .1345 sec. |

These investigators found that there was a high correlation between speed in sprinting and reflex time, the correlation coefficient being .815.

## THE TECHNIQUE

The apparatus employed for measuring the patellar tendon reflex time is a modification of that used by Tuttle[4] for recording the extent of the knee-jerk. A stimulus is delivered to the patellar tendon by means of a round-nosed hammer which is connected in series with a dry cell, signal magnet, and brass strip. The brass strip is placed over the patellar tendon and is held in place by means of a rubber band. When the stimulus is delivered to the patellar tendon by means of the hammer which strikes the brass strip, the impact elicits the jerk and at the same time closes the signal magnet circuit, thus marking the time of stimulation.

The subject is seated in a chair so that his legs are free to swing. The beginning of the response is marked on a kymograph by a stylus attached to a string running from the heel of the subject's shoe through a reducing pulley to a rubber band suspended from a ring stand. When the foot moves forward, the stylus is pulled down, thus indicating the beginning of the response. The rubber band causes the stylus to return to its original position, thus establishing a base line.

The response stylus and signal magnet are superposed just far enough apart so that a 100 d.v. electrically driven tuning fork can vibrate between them. Since all the recording apparatus is superposed, the speed of the kymograph may be neglected, except that it should turn fast enough to separate the tuning fork vibrations so that they may be easily read. When all is in readiness, an assistant spins the drum of the kymograph. During the spin, the stimulus is delivered, thus eliciting the reflex response. Since we are interested in only the latent period of the reflex, the recording stylus is set at an angle so that it leaves the drum soon after it leaves the base line. Now by counting the number of double vibrations of the tuning fork between the stimulus as indicated by the signal magnet and the beginning of the response as shown by the point where the recording stylus leaves its base line, the reflex time of the knee-jerk is obtained.

Typical records used as a basis for obtaining the data are shown in

[4] W. W. Tuttle, "An Apparatus for Automatically Eliciting and Recording the Patellar Tendon Reflex," *Am. J. Physiol.*, 68 (1924), 338-344.

Figure I. The record is turned over in the figure so that the response appears as an upward movement when, in fact, it is recorded as a downward movement of the stylus. It is made as a downward movement in order to simplify the technique by eliminating a number of pulleys. The time in seconds between (*A*) and (*B*) is considered the reflex time. From crest to crest or from trough to trough is read as 1/100 sec. If the stimulus is delivered, or if the response occurs somewhere between the crest and the tough, the time is interpolated to the third decimal place.

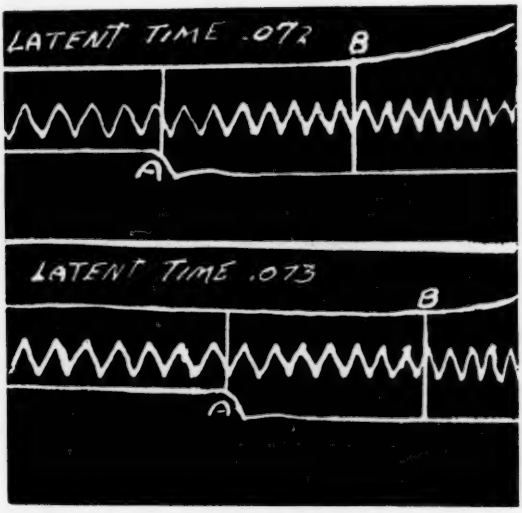


FIG. 1.—Records of patellar tendon reflex time. *A* is the application of the stimulus and *B*, the beginning of response.

## THE DATA

Data were collected from a group of eighty-two white and eighty-one negro subjects. The age of the subjects, in both groups, fell between sixteen and twenty-six years. This eliminated any influence which age might have on the reflex time. The experiments were conducted between 1:30 and 4:00 P.M., thus eliminating the influence of the time of day on the experiment.

The white subjects were students from the Southwestern Louisiana Institute. The negro subjects were taken from the upper grades of the negro public school and from a parochial school recreation association.

In order to secure sufficient data[5] for reliable conclusions, fifty

[5] Although it has been statistically proven that fifteen records of the patellar tendon reflex time are sufficient to establish a reliable mean, fifty records were taken in groups of ten on various occasions in order to get a truer representative performance by submerging such factors as fatigue, etc.

records were made of each subject's response. The records were taken in groups of ten, on five different days, so that a better cross section of their responses might be had.

*The Reflex Time of the White Group.*—A summary of the data collected from 82 white subjects is shown in Table I. The mean reflex time of the group is .0861 ± .0013 sec., with a range of .0551 to .1413 sec.

*The Reflex Time of the Negro Group.*—A summary of the data collected from 81 negro subjects is presented in Table II. The data show the mean reflex time of the negro group to be .0774 ± .0009 sec. with a range of .0557 to .1183 sec.

*A Comparison of the Patellar Tendon Reflex Times of Negroes and Whites.*—The obtained difference between the mean reflex time for the white group and the mean reflex time for the negro group is the difference between .0861 ± .0013 sec. and .0774 ± .0009 sec., or .0087 ± .0016 sec. in favor of the negro group. Mathematically stated, the obtained difference is 5.43 times the probable error of the difference, and is therefore significant.

## DISCUSSION

A comparison of the various patellar tendon reflex times found by other investigators shows that the mean reflex time varies from .0796 to .1385 sec. Our figure, .0861 sec., for white subjects, falls within these limits. In our experiment no claim is made that the figures are absolute. The same is true for other investigators. However, care was taken to maintain uniform conditions, so that whatever errors of a mechanical nature exist are constant throughout all of the experiments.

Although the obtained difference between the patellar tendon reflex time of whites and negroes is small, yet it is significant. No explanation for the difference is at hand. In the light of what is known concerning the relation of reflex time to speed in sprinting, the faster patellar tendon reflex time of the negro group suggests that their spinal responses might have a bearing on the speed of negro athletes in the sprints. It should be added that until a more complete study of the neuro-muscular responses of the negro is made, the data presented here are only suggestive and by no means conclusive.

## SUMMARY AND CONCLUSIONS

A study of 4,100 patellar tendon reflex times of 82 white subjects and 4,050 patellar tendon reflex times of 81 negro subjects shows that the mean of the former is .0861 ± .0013 sec., and of the latter .0774 ± .0009 sec. Since the obtained difference between the means is 5.43 times the probable error of the difference, the data justify the conclusion that the average patellar tendon reflex time of the negro group studied is significantly shorter than that of the white subjects.*

* This opportunity is taken to thank Dr. W. W. Tuttle for directing this research.

## TABLE I

THIS IS A SUMMARY OF THE MEAN PATELLAR TENDON REFLEX TIMES OF A GROUP OF EIGHTY-TWO WHITE SUBJECTS

| Subject Number | Latent Time | Range | Subject Number | Latent Time | Range |
|---|---|---|---|---|---|
| | *sec.* | *sec.* | | *sec.* | *sec.* |
| 1 | .0696 | .048-.110 | 42 | .0607 | .030-.077 |
| 2 | .0698 | .045-.091 | 43 | .1096 | .059-.205 |
| 3 | .1064 | .075-.138 | 44 | .0786 | .055-.099 |
| 4 | .0600 | .049-.068 | 45 | .0773 | .045-.110 |
| 5 | .0574 | .048-.070 | 46 | .1071 | .065-.180 |
| 6 | .0760 | .062-.095 | 47 | .1041 | .050-.186 |
| 7 | .0780 | .055-.097 | 48 | .0760 | .060-.094 |
| 8 | .0678 | .050-.090 | 49 | .0815 | .016-.115 |
| 9 | .0710 | .062-.098 | 50 | .0601 | .045-.090 |
| 10 | .0681 | .075-.081 | 51 | .0760 | .045-.110 |
| 11 | .1413 | .078-.293 | 52 | .0733 | .045-.093 |
| 12 | .1012 | .030-.165 | 53 | .0698 | .056-.079 |
| 13 | .1012 | .045-.180 | 54 | .0655 | .049-.154 |
| 14 | .0953 | .070-.120 | 55 | .0650 | .041-.088 |
| 15 | .0882 | .060-.136 | 56 | .1183 | .074-.220 |
| 16 | .1014 | .050-.140 | 57 | .0915 | .065-.138 |
| 17 | .0742 | .040-.115 | 58 | .0681 | .050-.110 |
| 18 | .0741 | .050-.109 | 59 | .0671 | .020-.115 |
| 19 | .0679 | .057-.067 | 60 | .1253 | .064-.200 |
| 20 | .1170 | .094-.157 | 61 | .1038 | .050-.127 |
| 21 | .0607 | .040-.075 | 62 | .0790 | .060-.092 |
| 22 | .0886 | .048-.172 | 63 | .0877 | .063-.105 |
| 23 | .0825 | .055-.113 | 64 | .1016 | .070-.132 |
| 24 | .1093 | .070-.165 | 65 | .0628 | .050-.070 |
| 25 | .0942 | .046-.143 | 66 | .0730 | .030-.115 |
| 26 | .0731 | .064-.090 | 67 | .1262 | .080-.239 |
| 27 | .0772 | .060-.094 | 68 | .0551 | .030-.085 |
| 28 | .1191 | .080-.150 | 69 | .0777 | .052-.125 |
| 29 | .0864 | .070-.107 | 70 | .0846 | .060-.116 |
| 30 | .0674 | .047-.096 | 71 | .1004 | .085-.280 |
| 31 | .0696 | .047-.098 | 72 | .0878 | .900-.100 |
| 32 | .0731 | .046-.128 | 73 | .0716 | .040-.100 |
| 33 | .1100 | .053-.144 | 74 | .0770 | .070-.098 |
| 34 | .0875 | .046-.160 | 75 | .0872 | .051-.174 |
| 35 | .0850 | .052-.114 | 76 | .0618 | .024-.130 |
| 36 | .1113 | .091-.250 | 77 | .1184 | .101-.135 |
| 37 | .1011 | .070-.174 | 78 | .0715 | .054-.085 |
| 38 | .1100 | .052-.167 | 79 | .1143 | .060-.220 |
| 39 | .1094 | .046-.150 | 80 | .1171 | .083-.150 |
| 40 | .0872 | .054-.127 | 81 | .0845 | .060-.120 |
| 41 | .0642 | .041-.112 | 82 | .0873 | .054-.145 |
| | | Mean .0861 ± .0013 sec. | | | |

## TABLE II

THIS IS A SUMMARY OF THE MEAN PATELLAR TENDON REFLEX TIMES OF A GROUP OF EIGHTY-ONE NEGRO SUBJECTS

| Subject Number | Latent Time | Range | Subject Number | Latent Time | Range |
|---|---|---|---|---|---|
| | *sec.* | *sec.* | | *sec.* | *sec.* |
| 1 | .0671 | .045-.103 | 42 | .0647 | .050-.079 |
| 2 | .0708 | .011-.104 | 43 | .0670 | .050-.087 |
| 3 | .1049 | .060-.160 | 44 | .0776 | .045-.132 |
| 4 | .0743 | .045-.120 | 45 | .0730 | .043-.110 |
| 5 | .0861 | .064-.140 | 46 | .0727 | .045-.175 |
| 6 | .1076 | .040-.240 | 47 | .0557 | .039-.070 |
| 7 | .1023 | .059-.175 | 48 | .0660 | .044-.088 |
| 8 | .0763 | .045-.200 | 49 | .0862 | .055-.149 |
| 9 | .0844 | .042-.154 | 50 | .1040 | .010-.218 |
| 10 | .0673 | .050-.078 | 51 | .0890 | .055-.187 |
| 11 | .0686 | .045-.116 | 52 | .0770 | .050-.099 |
| 12 | .0738 | .052-.102 | 53 | .0843 | .054-.160 |
| 13 | .0718 | .037-.180 | 54 | .0757 | .040-.118 |
| 14 | .0698 | .051-.090 | 55 | .0762 | .060-.104 |
| 15 | .0719 | .051-.090 | 56 | .0722 | .060-.095 |
| 16 | .0716 | .059-.095 | 57 | .0899 | .051-.205 |
| 17 | .0680 | .049-.093 | 58 | .0736 | .050-.101 |
| 18 | .0670 | .010-.011 | 59 | .0626 | .030-.092 |
| 19 | .0776 | .041-.100 | 60 | .0945 | .069-.151 |
| 20 | .0719 | .050-.095 | 61 | .0753 | .050-.120 |
| 21 | .0847 | .060-.120 | 62 | .0706 | .052-.085 |
| 22 | .0804 | .065-.101 | 63 | .1183 | .056-.221 |
| 23 | .0798 | .050-.125 | 64 | .0729 | .060-.085 |
| 24 | .0723 | .040-.116 | 65 | .0808 | .035-.117 |
| 25 | .0804 | .055-.134 | 66 | .0748 | .050-.095 |
| 26 | .0840 | .050-.120 | 67 | .0738 | .046-.101 |
| 27 | .0764 | .051-.100 | 68 | .0633 | .030-.094 |
| 28 | .0856 | .060-.141 | 69 | .0760 | .060-.093 |
| 29 | .0790 | .055-.120 | 70 | .0815 | .065-.105 |
| 30 | .0672 | .030-.099 | 71 | .0618 | .045-.079 |
| 31 | .0764 | .064-.090 | 72 | .0670 | .050-.085 |
| 32 | .0891 | .065-.160 | 73 | .0641 | .052-.077 |
| 33 | .0718 | .050-.106 | 74 | .0904 | .050-.155 |
| 34 | .0815 | .068-.187 | 75 | .0781 | .060-.100 |
| 35 | .0635 | .050-.089 | 76 | .0764 | .040-.159 |
| 36 | .0599 | .045-.079 | 77 | .0679 | .044-.093 |
| 37 | .0731 | .055-.177 | 78 | .0624 | .037-.081 |
| 38 | .1018 | .080-.145 | 79 | .0760 | .025-.150 |
| 39 | .0742 | .060-.095 | 80 | .0752 | .043-.116 |
| 40 | .0794 | .060-.100 | 81 | .0859 | .055-.115 |
| 41 | .1074 | .050-.190 | | | |

Mean .0774 ± .0009 sec.

# BOOK REVIEWS

ACHIEVEMENT SCALES IN PHYSICAL EDUCATION ACTIVITIES FOR BOYS AND GIRLS IN ELEMENTARY AND JUNIOR HIGH SCHOOLS. N. P. Neilson and Frederick W. Cozens. (A. S. Barnes & Co., 1935). 177 pages. $1.60.

This book provides an accurately constructed series of achievement scales in thirty-three activities for boys and twenty activities for girls. These scales should be of use in adapting the physical education program to the individual needs of pupils, in the stimulation of pupils to strive for individual improvement in motor skills, in grouping pupils homogeneously according to achievement for instructional purposes, in assigning school marks, and as a basis for intramural and interschool competition.

The scales assign scores ranging from one to a hundred for different levels of achievement in each event. These scores are expressed in the same type of unit of measurement, or in other words, have been reduced to a common denominator. This makes it possible to add scores for performances in different activities and to find averages of scores made in several events of different kinds. By the use of these scales one could, for example, add scores made in running, jumping, and throwing and could also find individual or group averages of scores made in these different kinds of activities.

Scores are provided in all activities for eight different classes of boys and girls. The classification plan used is the one incorporated in the California State course of study in physical education. It is what is commonly known as the "Exponent Plan" or the Reilly Plan and is based on the relative contributions which age, height, and weight make to performance in a variety of activities. The techniques used in the validation of this classification plan are described in the report.

In formulating the achievement scales a variation of the T-scale has been used. This form of scale is usually based on a range of 5 standard deviations above the mean and 5 standard deviations below the mean. The scales in this study have been constructed in the same general manner as a T-scale but the range includes only 3 times the standard deviation on each side of the mean. This range includes in a normal distribution 997 out of 1000 cases.

The scales have been set up in such a way that a score of 50 is assigned to the mean or average performance in each event. A performance at 3 standard deviations above the mean is assigned a score of 100 and a performance at 3 standard deviations below the mean is given a score of 0. In order to find the increment for each score increase, the standard deviation was multiplied by 3 (which is the number of standard deviations on the scale above and below the mean) and the product was then divided by 50.

The book provides definite and clear directions for giving each test. Suggested procedures and forms are provided for keeping records. There is also given a table which enables one to evaluate achievement scores in terms of the percentage of pupils above or below a given score. A boy can easily tell, for example, whether he is in the upper 10 per cent, middle 50 per cent, or lower 5 per cent of his group.

Apparently high standards of scholarship and methods have been maintained in the preparation of these achievement scales. The material is clearly stated and

is arranged in a usable and practical form. It can be used successfully in schools of different sizes and types. It is the opinion of the reviewer that these scales can be used safely and advantageously even by teachers with limited professional preparation. This publication is one of the most valuable and significant contributions that has been made in the field of achievement testing in physical education.

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COMMUNITY HYGIENE. L. B. Chenoweth, A.B., M.D., and W. R. Morrison, A.M., M.D. (New York: F. S. Crofts & Co., 1934). 317 pages, $2.50.

After an introductory chapter in which the authors define health, and classify various types of hygiene, they proceed at once to an excellent résumé of vital statistics as applied to the United States, selecting significant figures relative to death rates, also the extent of physical and mental defects.

Then follows a brief history of bacteria with which is tied up a standard outline of types and causes of diseases. Consideration is given to disease communication and to the media in which contagion flourishes, as well as to the sanitary precautions calculated to prevent the spread of such diseases. This includes such topics as soil as a medium for hookworm and tetanus; water for cholera, typhoid, and dysentery; food for its ptomaines (the term ptomaine is still retained), its alcohols, botulism, colon, and typhoid group, septic sore throat, tuberculosis, and parasites. The practical measures are well outlined, especially with regard to milk and water.

Waste disposal receives brief consideration, with hog feeding suggested as a close second to incineration for garbage. The chapter on animals as vehicles for dissemination of diseases is one of the best of the text, dealing chiefly with bovine tuberculosis, bubonic plague, tularemia, glanders, rabies, etc. Insects as spreaders of disease deserve the relatively extended treatment given. Conspicuous among them are mosquitoes in relation to malaria and yellow fever, flies for typhoid fever (perhaps this might be more emphasized), lice for pediculosis with varying attendant diseases, and ticks for Rocky Mountain spotted fever.

A brief consideration of modes of contact infection is followed by specific consideration of influenza, tuberculosis, common colds, and syphilis, with mention of many other diseases similarly transmitted. Stress is placed upon the importance of humans themselves as carriers and spreaders of disease, using the illustration of the 1933 spread of amoebic dysentery from a populous center of the United States.

Disinfection, defined as "the destruction of agents causing infection," is discussed under the heading of physical, gaseous and liquid. A historical sketch is given of immunity, and details are given concerning those diseases for which immunization processes have been established.

The relationship of air to health is discussed rather superficially, and much of the space given is devoted to exploding some of the common misconceptions. Public health administration discusses organization and function of state and local boards of health and goes extensively into vital statistics.

The book is attractive typographically and fairly well documented; most chapters are followed by selected bibliographies for further studies; a glossary and fairly complete index combine to render the book not only attractive in appearance and complete in treatment, but very convenient for ready reference.

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THE THEORY OF PLAY. Elmer D. Mitchell and Bernard S. Mason. (A. S. Barnes & Company, New York City, 1934) 536 pp. $2.80.

*The Theory of Play* is a re-written and enlarged edition of *The Theory of*

*Organized Play* published in 1923 by Bowen and Mitchell. In view of the growing and changing philosophy of educational objectives, the extensive research in the field of psychology in regard to human conduct and behavior, the recognition of the value of physical education and play as a phase of general education, the changing and broadening of objectives and techniques in the field of physical education and play to counteract the dangers of enforced leisure time, it is particularly opportune that this edition of *The Theory of Play* be produced at this time.

The book is set up in four distinct divisions; namely, The Historical Background of the Present Play Movement; The Theoretical Explanation of Play; The Need for Play in Modern Life and Its Place in Education; and The Administration and Organization of Play.

Division No. I, on The Historical Background of Play, while reviewing the earlier attitudes toward play, also brings out the scientific and the social attitudes in the light of present-day scientific thought and social needs. The play movement in the different countries is reviewed, and then the unusual background of its development in the United States is traced.

In Part II the earlier attempted explanations of play have again been carefully reviewed in detail, showing what each of these theories may have contributed to the general understanding of play. But it is becoming more and more obvious that these earlier theories of play cannot be fully accepted, therefore the *discussion on the newer interpretations of play motivation is possibly the greatest contribution of the new publication.*

Without going into detail, play is explained by the fact that the individual seeks *self-expression* by what he is, with the physiological and anatomical structure that he has, with the degree of physical fitness that he has, and with the psychological inclinations that he has. Man plays to feel the thrill of accomplishment as well as from a physical desire or need.

The freedom theory of play, suggested by Curti, which emphasizes the rôle of play in the satisfaction of motives, is discussed. The compensatory aspect of play is also reviewed, showing that the child, having a feeling of lack of freedom and power in a world of stronger playmates and adults, escapes from this feeling by make-believe play. The freedom theory and the compensatory theory, while partially substantiating theories in themselves, are no more or less than certain aspects of the self-expression theory.

The chapter on "Interests" has been entirely re-written and gives a more modern sociological viewpoint of the motivation of play behavior, and also gives a practical classification of play forms. The shift from pure inborn impulse to socially acquired behavior patterns as the basis of motivation, discussed in this chapter, substitutes for the concept of "Instinct" that of "Wishes." *Wishes,* we will recall, refer to the universal desires of man, to the things which men everywhere want. *Interests* are individual matters. However, the specific interests of individuals, although varying in detail, fall under certain types which can be classified. A knowledge of what there is in the way of universal interests is extremely important to play leaders, in that it forms a basis on which programs of activities may be built.

Part III discusses in a most thorough manner the many significant changes which have taken place in our social life in recent years, and which have resulted in serious social maladjustments. The chapter sees in the constructive use of leisure a solution for many of these maladjustments.

The next four chapters under Part III take up in turn "The Physical Benefits of Play," "Play and Mental Growth," "Play in Character Formation," and "Play in Citizenship." The chapter on "Play in Character Formation," particularly, brings to the reader the most up-to-date information on the process of instruction, laws of learning in character development, concomitant learn-

ings in play activity, and means of character instruction in play groups. The problem of transfer is also discussed.

"How Play Is Promoted" is the introductory chapter to Part IV. It suggests in a broad and comprehensive manner the most desirable and feasible means of promoting play activities. The chapter brings out the point that play is too important a phase of life to be administered by the schools and public playgrounds alone; and then goes on to point out the contributions of the semi-public agencies, such as the Boy Scouts, Girl Scouts, Y.M.C.A., and Y.W.C.A. groups, industries, settlement houses, and others. The commercial aspect of public recreation is also discussed somewhat in detail.

Chapter Fourteen, on "The Administration of Public Recreation," discusses the various methods of the administration of city recreation. Chapter Fifteen, on "The Play Center," discusses in detail playground construction and equipment, activities, wider use of the school plant, and the community center. This chapter is very important from the practical standpoint of construction, space, and equipment. Chapters Sixteen and Seventeen deal with boys' and girls' clubs and the organized summer camp. Club organizations are playing a larger part in the leisure-time life of youth in America, and organized camping is an integral part of the present-day play movement.

Chapter Eighteen, on "Athletics in High Schools and Colleges," holds a wealth of material. This chapter discusses the physical and educational objectives of athletics, standards of sportsmanship, the value of athletics for all, and the place of athletics in the education for leisure.

Chapters Nineteen and Twenty deal with the organization of play activities and leadership. Chapter Nineteen, particularly, discusses the nature or types of activities adaptable to the different age levels, school play days, programs for summer playgrounds, suggestions for running off a demonstration day or neighborhood festival, discusses classification of players for competition showing various methods used; shows how to draw up meets, leagues, and tournaments; has suggestions for honor point systems and awards; and plans for all-year group athletic efficiency.

Chapter Twenty recognizes the value of trained leadership, and shows the practical benefits of supervision and leadership.

As a concluding statement I should like to say that this edition of *The Theory of Play* holds a wealth of material both from the theoretical and practical standpoint. The material is so organized that it can well be used as a text; the practical material can be accepted as standard, and all theoretical discussions present the newer ideas in present-day educational thought. Moreover, the excellent bibliography at the close of each chapter, giving all the best references dealing with the chapter discussion, adds great value to the publication.

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YOUR CARRIAGE, MADAM! A GUIDE TO GOOD POSTURE. Janet Lane (New York: John Wiley and Sons, Inc., 1934). 130 pages. $1.75.

Miss Lane has made an unusually fine contribution in her practical and common-sense approach to improving posture. She has adequately described good posture as being "lined up for grace and action, your body carried in perfect balance, your bones lying smoothly in place and all your muscles working on the right tracks"; and in the various chapters has successfully portrayed the development of this ideal.

The book is written in a light popular style which is conducive to pleasant reading; facts are stated in such a clear and convincing manner that you cannot but recognize your own shortcomings and cannot but experience an immediate reaction to the suggestions made.

The illustrations and descriptions are

startlingly clear and make a vivid impression—even on the person who has tried "exercises" for good posture or reducing, and has given up in despair.

The book is unusual in that it describes no specific exercises as a means to good body mechanics—the emphasis is rather on the way in which the body is used during normal daily activity. There are many practical hints for the woman as she does her housework, for the golfer who wishes to improve his game, or for the tired business man or woman who does not know how to relax. The person who is noticing the effect of confining or nervous work is stimulated to analyze his or her activities in terms of the right and wrong muscle patterns. Not only is self-analysis induced, but a standard is set for the correct body line-up which produces better work with less fatigue.

It is the kind of book every teacher of physical education would like to have written, for it describes in everyday language the posture ills, and explains in such a way that the layman can understand, the "why" and "how" of improvement. It is technical enough to satisfy the teacher with her knowledge of anatomy, kinesiology, and physiology, and yet thoroughly understandable to the interested reader.

HAZEL KINZLY
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LEGENDS AND DANCES OF OLD MEXICO. Norma Schwendener and Averil Tibbels (New York: A. S. Barnes and Co., 1934), 111 pages. $2.00.

In *Legends and Dances of Old Mexico* the authors offer descriptions and analyses of typical Mexican Spanish and Mexican Indian dances in a manner that should prove of interest to the layman as well as to the teacher or student of the dance.

To those of us who have lived or visited in the Southwest or in Mexico the colorful fiestas of the Mexicans and Indians are pictures to be remembered. The primitive dances which go to make up these celebrations, while simple in pattern and step, are executed with such accuracy and such sincerity on the part of the performers that they appear at first to be complicated in rhythm and design. The dancers of the family or of the village are re-creating the stories handed down within the family or tribe. Each dance possesses a wealth of symbolism expressed by means of costume, movement pattern, intensity of movement, or type of accompaniment.

The casual observer is puzzled by the elaborately painted markings on one dancer, by the peculiar head-dress of another, by the unusual posturing of another, and may take away with him only an impression of one or more rhythms, repeated over and over, until they lose themselves in dull monotony. In the present volume the setting afforded by a series of primitive drawings representing the various dances and by legends and facts concerning their origin and meaning provides a rich background for the technical descriptions of the steps and formations used within the dances.

For the teacher of folk dancing or rhythms the dances herein described open up a new field because of their usability: step patterns are clearly analyzed; costumes typical in design and color are described; and the quality or style demanded in each dance is pictured as the accompanying legend is told.

The problem of accompaniment for the dances is treated in a variety of ways. To quote: "The original accompaniments, made up as they are of many short phrases repeated interminably, are far too long to be given in their entirety, thus only the characteristic phrase or phrases have been used in the notation. . . . To those unaccustomed to the idiosyncrasies of Mexican music the use of the more primitive instruments, such as gourds, rattles, and drums is not only more interesting but far more satisfying than the Mexican melody. . . . Singing the

air is thoroughly consistent with Mexican custom. For school as well as other uses it is suggested that the voice accompanied by a percussion instrument be used. . . . With the present interest in the construction and use of primitive instruments of both melody and percussion type, no school or dance group should lack the means of accompanying these Mexican dances." These many helpful suggestions of the authors regarding the accompaniment show the possibility of using the material even though no music be available. However, an appendix in the back of the volume giving more complete references for music where such are to be had would be of value to the teacher or student who might wish to use more than rhythmic or melodic accompaniment.

Teachers and students of the dance will find *Legends and Dances of Old Mexico* a valuable addition to their libraries. It is an excellent collection of the primitive rhythms of the Mexican and because so much more than steps and counts is offered in this book it is a worth-while contribution to the study of the dance.

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THE LABORATORY NOTEBOOK METHOD IN TEACHING PHYSICAL DIAGNOSIS AND CLINICAL HISTORY RECORDING. Logan Clendening, M.D. (The C. V. Mosby Company, 1934) 71 pages.

This pamphlet is intended to be used as a working guide for the medical student in his elementary study of physical diagnosis. It presents a logical and sequential routine for a beginning student in this subject, which, once mastered, will give him the pattern of a thorough examination and will be of inestimable value in helping him to make accurate diagnoses.

The first half of the book is planned to familiarize the student with the procedure of a routine examination. The exercises in the last half of the book are planned to give practice in the examinations and diagnoses of some of the pathological conditions which occur most frequently.

The whole book is a valuable guide to effective classroom work in the subject of medical examination and diagnosis. It would be more helpful, however, if it were a companion manual accompanying a definite text, or if it contained page references to various texts on physical diagnosis.

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FOOD, NUTRITION, AND HEALTH. E. V. McCollum and J. Ernestine Becker. Third Edition, Rewritten. (Published by the Authors). $1.50.

Despite the increase in our knowledge of the younger science of nutrition, faddists and medical quacks have found opportunity to disseminate much false and misleading information about foods in their relation to health. Under these conditions, it is a pleasure to call attention once more to this non-technical account of the most important discoveries in this field, as set forth by these outstanding authorities in a highly readable way. One gains from this book a clear-cut conception of an adequate diet as the biochemist visualizes it, and the dietary properties of the more important foodstuffs as well as the effects of deprivation of individual nutrients so far as they are known. The limits as to what can and what can not be accomplished by diet receive the proper attention, and there is recommended a system of diet which will not only promote health, but which is also sound from the agricultural, physiological, and economic standpoint.

Fundamental to their entire treatment of the subject is the intention of the authors to establish an educational basis for understanding how best to spend the money allotted for food in the family budget. Briefly, this book will serve as a guide to the application of the science of nutrition to the health problems of the individual.

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